# Appendix A: Course Schedule

# for the study programme Product-Service Engineering (work-integrated) B.Eng.

Please note: The German version of this document is the legally binding version. The English translation provided here is for information purposes only.

First sem	nester	L	ST	Е	P/S	SSS	СР	
Module	Module title	Module						
number		ID						
3102	Electrical Engineering I	ELO1	1	0	3	0	1.5	5
3132	Fundamentals of Business Administration	GBW	2	0	2	0	1	5
3353	Foundations of Computer Science	GDI	2	0	1	1	1.5	5
3218	Mathematics I	MATH1	2	0	2	0	1	5
3310	Product-Service Engineering – Introduction and Overview	PSE	2	0	1	1	1.5	5
<u> </u>						Tota		25
Second s	emester		L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
3019	Databases	DUD	2	0	1	1	1.5	5
3105	Electrical Engineering II	2	0	1	1	1.5	5	
3311	Principles of Mechanics	2	0	1	1	1.5	5	
3257	Mathematics II	MATH2	2	0	2	0	1	5
3267	Object-Oriented Programming	OOP	2	0	1	1	1.5	5
						Tota	I CP:	25
Third ser	nester		L	ST	Е	P/S	SSS	СР
Module number	Module title	Module ID						
3254	HMI and User Interfaces	HMI	2	0	2	0	1	5
3256	Cost Accounting/Product Costing	KRPK	2	0	2	0	1.5	5
3258	Mathematics III	MATH3	2	0	2	0	1	5
3266	Metrology/Sensors	MTSO	2	0	1	1	1.5	5
3112	Practical Module I	PX1	0	0	0	0	0	5
3121	Technical English	TCE	2	0	0	2	1	5
	,		I	I	1	Tota	I CP:	30
Fourth se	emester		L	ST	E	P/S	SSS	СР
Module number	Module title	Module ID						
3253	Basics of Mechanical Design	GDK	2	0	2	0	1	5
3117	Industrial Control Technology	IST	2	0	1	1	1.5	5
3125	Feedback Control Engineering	RTK	2	0	1	1	1.5	5
3260	Service Engineering	SVE	1	0	3	0	1.5	5
3224	Statistics	STAT	2	0	2	0	1	5
	1	1	1	1	Tota	I CP:	25	
Fifth sem	nester	L	ST	E	P/S	SSS		
Module number	Module title	Module ID				., 3		
Hullibei								

3122	Practical Module II	PX2	0	0	0	0	0	5
3264	Networking and IoT Solutions	IOT	2	0	1	1	1.5	5
9017	Elective Module: Product-Service Engineering	WM				0		5
9017	Elective Module: Product-Service Engineering				0		5	
						Tota	I CP:	25
Sixth ser	mester	L	ST	E	P/S	SSS	СР	
Module number	Module title	Module ID						
3129	Practical Module III	PX3	0	0	0	0	0	5
3309	Product Development and Requirements Engineering	PQRE	2	0	2	0	1.5	5
3259	Safety and Security	SAS	2	0	1	1	1.5	5
9017	Elective Module: Product-Service Engineering	WM				0		5
9017	Elective Module: Product-Service Engineering	WM				0		5
			•			Tota	I CP:	25
Seventh	semester		L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
3133	Bachelor Thesis	BA	0	0	0	0	0	12
3252	Diagnosis and Predictive Maintenance	DPM	2	0	2	0	1	5
3134	Colloquium	KOL	0	0	0	0	0	3
3255	Sales and Customer Management	VUK	2	0	2	0	1	5
						Tota	I CP:	25

Abbreviations of the teaching forms: L = lecture, ST = tuition in seminars, E = exercise, S = seminar, P = practical, SSS = supervised self-study (all data in semester credit hours);

CP = credit points

W/S = winter/summer semester

Elective I	Modules Product-Service Enginee	ring							
Module number	Module title	Module ID	W/ S	L	ST	Е	P/S	SSS	СР
3204	Data Analytics	DML	W	2	0	1	1	1	5
3255	Maintenance and Spare Parts Management	IEM	W	2	0	2	0	1	5
3340	Machine Learning	ML	S	2	0	1	1	1	5
3201	Quality Management	QMG	S	2	0	2	0	1	5
3261	Service Communication and Training Concepts	SKTK	S	2	0	2	0	1	5
3262	Smart Services and Devices	SMSD	W	2	0	2	0	1	5
3263	Usability Engineering	UEG	S	2	0	2	0	1	5
3265	Contract and Liability Law	VHR	W	2	0	2	0	1	5

# Appendix B: Module catalogue

for the study programme Product-Service Engineering (work-integrated) B.Eng.

Bachelor Thesis	1520
Data Analytics	1521
Databases	1523
Diagnosis and Predictive Maintenance	1525
Electrical Engineering I	1527
Electrical Engineering II	1529
Fundamentals of Business Administration	1531
Foundations of Computer Science	1533
Basics of Mechanical Design.	1535
Principles of Mechanics	1537
HMI and User Interfaces.	1539
Industrial Control Technology	1541
Innovation and Project Management	1543
Maintenance and Spare Parts Management	1545
Colloquium	1547
Cost Accounting/Product Costing	1548
Machine Learning	1550
Mathematics I	1552
Mathematics II	1554
Mathematics III	1556
Metrology/Sensors	1558
Object-Oriented Programming	1560
Practical Module I	1562
Practical Module II	1563
Practical Module III	1564
Product-Service Engineering – Introduction and Overview	1565
Product Development and Requirements Engineering	1567
Quality Management	1569
Feedback Control Engineering	1571

Safety and Security	1573
Service Engineering	1575
Service Communication and Training Concepts	1577
Smart Services and Devices	1579
Statistics	1581
Technical English	1583
Usability Engineering	1585
Networking and IoT Solutions	1587
Contract and Liability Law	1589
Sales and Customer Management	1591
Elective Module: Product-Service Engineering	1593

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Bach	elor Thesi	s							BA	
Identi numb	fication	Workload:	Credits:	Study	semest	er:	Frequency offer	of the	Durati	on:
	3133 360 h		12	7th s	em.		Annual (Summer	)	1 semester	
1	1 Course:		Planned group si	zes	Scope	9	Actual control / classroom teaching		Self-stu	dy
	Lecture		60 students		0	SCH	0	h	360	h
	Tuition in	seminars	30 students		0	SCH	0	h	0	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical of	or seminar	15 students		0	SCH	0	h	0	h
	Supervise	d self-study	60 students		0	SCH	0	h	0	h
3	Learning outcomes/competences:  After successfully completing the bachelor thesis, students are able to independently work on an appropriately present a practice-oriented task from their special subject area, both in the subject-specific details and in the interdisciplinary contexts, using scientific methods within a specified period of times.									ct-specific
	programi projects determin	me with a desc at the universi ed by an emp	an independent a cription and explaity or from opera crircal investigati ifferent forms ca	anation tional p on or b	of its s problem by cond	olution. is with ceptual	It can be dan engineer	lerived from	m curren eter. It ca	t research an also be
4	Forms of	teaching:								
			ith faculty tutorin	ng						
5	Participati	ion requirement	s:							
	Formal:	-								
	Content:		dinated topic from	n the st	udent's	special	subject are	ea		
6	Forms of	assessment:								
7	Prerequisi	te for the award	of credit points:							
8	Application of the module (in the following study programmes)  Digital Logistics (work-integrated) B.Eng., Digital Technologies (work-integrated) B.Eng.,  Mechatronics /Automation (work-integrated) B.Eng., Product-Service Engineering (work-integrated)  B.Eng. and Industrial Engineering and Management (work-integrated) B.Eng.									
9	-	ce of the grade for to BRPO	or the final grade:							
10		oordinator:								
	N. N.									
11	Other info	ormation:								
12	Language	:								
	German									

Data	Analytics								DML					
	Identification Workload:		Credits:	Credits: Study			Frequenc	cy of the	Duration:					
3204			5	5th sem.			Annual (Winter)	)	1 semester					
1	Course:		Planned group	sizes	Scop	e	Actual / classr teachin		Self-study					
	Lecture		60 students		2 SCH 0 h			h	56	h				
	Tuition in	seminars 30 students			0	SCH	0	h	0	h				
	Exercise	20 students			1	SCH	8	h	54	h				
	Practical	or seminar	15 students	1	SCH	16	h	0	h					
	Supervise	ed self-study	60 students		1	SCH	16	h	0	h				
2	Learning	outcomes/com	petences:			Į.								
	Students	S:												
	•	know and ma	ster the basic cor	ncepts ar	nd metl	hods of d	lata analy	sis and statis	tical lea	rning.				
	•	<ul> <li>are able to access internal and external data sources.</li> </ul>												
	•	• can understand the procedures for classification, modelling and prediction of												
		data sets and	apply them to ex	amples.										
	1				hasis handling of NaCOI databases and describe managinal data be atotistic									

- master the basic handling of NoSQL databases can describe numerical data by statistical characteristic values and visualise them in a common way.
- are able to analyse large amounts of data in a targeted as well as exploratory manner, whereby
  a diverse range of methods from the field of statistics and machine learning is available to
  them.
- are able to understand the basic procedure for analysing very large amounts of data on Hadoop clusters.

#### 3 Contents:

- Introduction and general overview ("Small Data" vs. "Big Data")
- NoSQL database systems
- Tapping data sources
- Basics of programming with Python (which is used in the exercises for practical data analysis)
- Basics of descriptive statistics
- Visualisation of data
- Correlation analysis and regression
- Time series analysis
- Basics of machine learning
- Pre-processing of data (e.g. dimension reduction)
- Unsupervised learning (e.g. clustering)
- Supervised learning I: Classification (e.g. via support vector machines)
- Supervised learning II: Learning of arbitrary input-output correlations (e.g. with artificial neural networks)
- Entry into large-scale data analysis with Hadoop

# 4 Forms of teaching:

Self-study units, exercises and practicals in the form of face-to-face events

5	Participation requ	irements:								
	Formal:	-								
	Content:	Content: -								
6	Forms of assessme	ent:								
	Term paper, written examination, project work or oral examination									
7	Prerequisite for the award of credit points:									
	Module examina	ation pass and course assessment								
8	Application of the	module (in the following study programmes)								
	Digital Logistics (work-integrated) B.Eng. and Product-Service Engineering (work-integrated) B.Eng.									
9	Importance of the	grade for the final grade:								
	according to BR	PO								
10	Module coordinat	or:								
	N. N.									
11	Other information	:								
	-									
12	Language:									
	German									

numbe		Workland										
	Identification Workload: Credits: number:				Study	semeste	er:	Frequency offer	of the	Duration:		
5019	3019 150 h			5	2nd s	2nd sem.		Annual (Summer)		1 semester		
1	Course:		Pl	anned group siz	group sizes Scope		;	Actual co	ontact time om	Self-study		
	Lecture		60	) students		2	SCH	0	h	68	h	
	Tuition in	seminars	30	) students		0	SCH	0	h	0	h	
ı L						_						
	Exercise			) students		1	SCH	8	h	34	h	
	Practical of	or seminar	15	students		1	SCH	16	h	0	h	
	Supervised	d self-study	60	) students		1.5	SCH	24	h	0	h	
2	Learning of	outcomes/co	ompeten	ices:			<u>.</u>	<b> </b>	1			
	_											
3	Students: <ul> <li>acquire basic knowledge about the architecture, functioning and use of database systems and know the principles of the organisation of a database system</li> <li>acquire knowledge about modern (object-oriented) and classical data modelling including the meaning of normalisation rules</li> <li>are able to perform a complete relational database design, starting from a requirements specification are proficient in standard SQL to perform simple and complex queries, as well as change operations.</li> <li>gain the ability to evaluate and select database technologies</li> <li>can plan and implement database projects and develop a modern database application</li> </ul> <li>Contents:         <ul> <li>Introduction to database concepts and database technologies (data modelling, normalisation theory, database language SQL)</li> <li>Basics of database systems (database design, database definitions, database queries)</li> <li>Data Manipulation Language (DML, German "Datenverarbeitungssprache"), Data Definition Language (DDL, German "Datenaufsichtsprache")</li> <li>Efficiency of SQL queries, index structures</li> <li>Authorisation concepts</li> </ul> </li>											
4	Forms of t	-	ercises	and practicals	in the	form of	f face-to	o-face event	·c			
	Sen-stud	y units, ex	cicises	and practicals	in the	101111 0	1 1400-10	J-1ace eveni	.o			
5	Participati	on requirer	nents:									
	Formal:	] -										
	Content:	-										
6	Forms of a	assessment:										
				nation, combi	ned exa	aminati	on, proj	ject work, o	ral examir	nation or		
				g the course								
7				credit points: and course ass	sessmer	nt						

8	Application of the module (in the following study programmes)
	Digital Logistics (work-integrated) B.Eng., Digital Technologies (work-integrated
	B.Eng., Product-Service Engineering (work-integrated) B.Eng. and Industrial Engineering and
	Management (work-integrated) B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module coordinator:
	Dr. rer. nat. Sabrina Proß
11	Other information:
	-
12	Language:
	German

Diag	nosis and	Predictiv	e Mainte	enance						DPM	
Identi numb	fication	Worklo	oad:	Credits:	Study	semest	er:	Frequency offer	of the	Duration	:
3252		150 h		5	5th seme	or	7th	Annual (Winter)		1 semester	
1	Course:		P	Planned group sizes Scop		Scope	2)	Actual co / classroo teaching	ntact time m	Self-study	
	Lecture		60	0 students		2	SCH	0	h	56	h
	Tuition in	seminars		0 students		0	SCH	0	h	0	h
	Exercise			0 students		2	SCH	16	h	62	h
	Practical			5 students		0	SCH	0	h	0	h
	Supervise	ed self-stu	dy 60	0 students		1	SCH	16	h	0	h
	analysis, methods solutions	data-ba They do	sed analy evelop al nical discr	y have acquire ysis of measur Igorithms for s ussions and ju mple faulty pro	rement signal a stify the	series, nalysis eir appr	etc. and pa	l can establ ttern classif	ish conne	ections betw nd can expl	ween the ain their
4	Contents:  Signal-based diagnosis, limit value/trend monitoring Trajectory monitoring and plausibility check Model-based diagnosis Analysis of signal models and process models Correlation and spectral analysis Parameter estimation Parity equations Condition monitoring Vibration analysis Predictive maintenance Data-based analysis Presentation of selected data mining challenges: Classification, clustering etc.  Forms of teaching:										
5	of Participat			and practical	s in the	10rm o	1 1ace-10	)-race event	s		
5	Formal:	- J. Toquii	-								
6	Content: Forms of	acceceme	- nt·								
6	Term pa	per, writt	ten exam	ination, projec	et work	or oral	examin	ation			
7	Prerequisi Module			credit points:							

8	Application of the module (in the following study programmes)
	Digital Technologies (work-integrated) B.Eng. and Product-Service Engineering (work-integrated)
	B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module coordinator:
	N. N.
11	Other information:
	-
12	Language:
	German

2	Course:  Lecture Tuition in  Exercise Practical of Supervise Learning of The stud understan networks They will circuitry. They kno required  Contents:	or seminar  d self-study  outcomes/components have based and analys for direct currel also know to use applications.  Basic terms an Derivation of the seminar of the semin	Planned group si  60 students 30 students 15 students 60 students 60 students etences: sic knowledge of the physical relatement circuits. In an and the materials and the basic equation anched DC circuits and the basic equation anched DC circuits and the properties of the physical relatement circuits.	1st see	Scope  1 0 3 0 1.5 ical ens in elethey cas of resiductors	SCH SCH SCH SCH SCH SCH signeering an solve sistors and as non-	and to cal simple field nd capacito	h h h h dents are	mple circu electrostat ow to use t	h h h h orrectly its and ics.
3102	Course:  Lecture Tuition in  Exercise Practical of Supervise Learning of The stud understan networks They will circuitry. They kno required  Contents:	seminars or seminar d self-study outcomes/components have based and analys for direct currel also know to ow how to use applications.  Basic terms an Derivation of to Simple and branch	Planned group si 60 students 30 students 20 students 15 students 60 students etences: sic knowledge of the physical relatement circuits. In a the materials and the homogeneous see the physical relatement circuits and the materials and the homogeneous see the physical relatement circuits. In a the materials and the homogeneous see the physical relatement circuits and the materials and the physical relatement circuits.	zes  of electricionships, ddition, design emicone	Scope  1 0 3 0 1.5 ical ens in elethey cas of resiductors	SCH SCH SCH SCH SCH sch sch sch agineerin ectricity an solve sistors an	Annual (Winter)  Actual condition of classroom teaching or condition of the condition of th	h h h h h cleants are cleanter sind tasks in ors and ho	Self-study  32 0 70 0 able to comple circuelectrostatow to use to	h h h h orrectly its and ics. them in
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2	Tuition in  Exercise  Practical of  Supervise  Learning of  The stud  understan  networks  They will  circuitry.  They kno  required  Contents:	or seminar  d self-study  outcomes/components have based and analys for direct currel also know to use applications.  Basic terms an Derivation of the seminar of the semin	30 students 20 students 15 students 60 students etences: sic knowledge of the physical relatement circuits. In a the materials and the homogeneous see the physical relatement circuits and the materials and the homogeneous see the physical relatement circuits. In a the materials and the homogeneous see the physical relatement circuits and the homogeneous see the physical relatement (a) the physical relatement (b) the physical relatement (c) the ph	ionship: ddition, design emicone ectrical ns, Ohr	0 3 0 1.5 ical ens in electrons of resiductors	SCH SCH SCH SCH SCH agineerin ectricity an solve sistors an	0 24 0 24 g. The study and to call simple field and capacitor of the capac	h h h dents are loulate sind tasks in ors and ho	0 70 0 able to comple circulelectrostatow to use to	h h h orrectly its and ics.
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2	Supervise  Learning of The stud understar networks They will circuitry. They knot required  Contents:  I S	d self-study outcomes/components have based and analyst for direct currel also know the base applications.  Basic terms an Derivation of the self-study	60 students etences: sic knowledge of the seephysical relaterent circuits. In a the materials and the homogeneous seephomogeneous seephomogene	ionship: ddition, design emicone ectrical ns, Ohr	1.5  ical en s in ele they consorted ductors	SCH schrift sc	g. The stude and to call simple field and capacito	h  dents are lculate sind tasks in ors and ho	able to comple circuelectrostat	h orrectly its and ics.
2	Learning of The stud understar networks They will circuitry. They knot required	putcomes/components have based and analyst for direct currel also know the based owner of the based of the ba	etences: sic knowledge of se physical relaterent circuits. In a the materials and the homogeneous se homogeneous se homogeneous in el de duantities in el the basic equation	ionship: ddition, design emicone ectrical ns, Ohr	ical en s in ele they ca s of res ductors	agineerin ectricity an solve sistors a	g. The stude and to call simple field and capacito	dents are lculate sind tasks in	able to comple circuelectrostat	orrectly its and ics.
3	The stud understan networks They will circuitry. They kno required	ents have based and analyst for direct currel also know the based owners.  Basic terms and Derivation of the sample and branches and br	sic knowledge of see physical relaterent circuits. In a the materials and the homogeneous see homogeneous see display the display in ellipse the basic equation in the second sec	ionship: ddition, design emicone ectrical ns, Ohr	s in ele they can s of resiductors	ectricity an solve sistors a	and to cal simple field nd capacito	lculate sind tasks in ors and ho	mple circu electrostat ow to use t	its and ics.
3	The stud understan networks They will circuitry. They kno required	ents have based and analyst for direct currel also know the based owners.  Basic terms and Derivation of the sample and branches and br	sic knowledge of see physical relaterent circuits. In a the materials and the homogeneous see homogeneous see display the display in ellipse the basic equation in the second sec	ionship: ddition, design emicone ectrical ns, Ohr	s in ele they can s of resiductors	ectricity an solve sistors a	and to cal simple field nd capacito	lculate sind tasks in ors and ho	mple circu electrostat ow to use t	its and ics.
	• I • I	Derivation of t Simple and bra	he basic equation	ns, Ohm	_	ering				
4	• I	Derivation of t Simple and bra	he basic equation	ns, Ohm	_	ering				
4	• I	Derivation of t Simple and bra	he basic equation	ns, Ohm	_	Ü				
4	• 5	Simple and bra	•							
4		-		LLO						
4		viethods for ca	alculating DC circuits							
4	• 1		gy and electrical							
4			ic field, manifest	-	and for	ces				
4			charging and dis							
4		=	ypes of resistors	_						
4			semiconductor c	_			, NTC, VD	R		
4			ct current circuit							
	Forms of	eaching:								
	Learning	units for self-	study, classroom	sessior	in the	e form of	fexercises			
		on requirements	s:					-		
_	Formal:	-								
	Content:	assessment:								
~			ombination exan	nination	or oral	examin	ation			
			of credit points:		or oral	Camilli				
		examination pa								
			e (in the following	study pr	ogramm	nes)				
		onics/Automat d) B.Eng.	ion (work-integr	ated) B.	Eng. ar	nd Produ	ct-Service	Engineeri	ng (work-	
			or the final grade:							
10	Importance of the grade for the final grade: according to BRPO Module coordinator:									

11	Other information:
12	Language:
	German

Elect	trical Engi	neering	II							ELO2	
Identi	ification	Worklo	oad:	Credits:	Study	semeste	er:	Frequency of the offer		Duration:	
3105				5	2nd sem.			Annual (Summer)		1 semester	
1	Course:		P	Planned group sizes Scope		Actual co / classroo teaching	ntact time m	Self-study	,		
	Lecture		6	0 students		2	SCH	0	h	56	h
	Tuition in	seminar	s 3	0 students		0	SCH	0	h	0	h
	Exercise		2	0 students		1	SCH	8	h	46	h
	Practical	or semina	ar 1	5 students		1	SCH	16	h	0	h
	Supervise	d self-stu	ıdy 6	0 students		1.5	SCH	24	h	0	h
2	Learning outcomes/competences:  The students have basic knowledge of electrical engineering. They are able to understand and analys physical relationships in electricity and magnetism. With the help of complex calculation, they ca also interpret and calculate demanding circuits from the AC range.  In addition, they can solve simple tasks on the magnetic field. They will also know the materials a designs of coils and transformators and know how to use them in terms of circuitry.					hey can					
4	Contents:  The static and time-variant magnetic field Calculation of magnetic circuits Induction law and inductance Basic concepts of alternating current technology Description of alternating variables with the aid of complex calculation Procedure for calculating alternating current circuits Locus curve and floor diagram Power in an AC circuit Improving the power factor The transformer Construction and designs of coils and transformers										
5	Forms of Learning Participat	g units fo	or self-stu	dy, classroom	events	in the f	form of	exercises ar	nd practica	als	
3	Formal: Content:	ion requi	-								
6	Forms of			bination exam	ination	or oral	examir	nation			
7	Prerequis	ite for the	e award of	credit points:							
8	Applicati	on of the onics/Au	module (i itomation	and course assorted the following at the	study pr	ogramm		uct-Service	Engineeri	ng (work-	
9				he final grade:							
	accordin										
10	Module c Prof. Dr.		or: Schwere	ltfeger							

11	Other information:
	-
12	Language:
	German

Fund	Fundamentals of Business Administration							GBW	GBW		
	ification	Workle	oad:	Credits:	Study	semeste	er:	Frequency offer	of the	Duration	:
3132	3132 150 h			5 1st semes		or 3rd ster		Annual (Winter)		1 semester	
1	Course:		F	Planned group siz	Scope		Actual contact time / classroom teaching		Self-study		
	Lecture		6	60 students		2	SCH	0	h	56	h
	Tuition in seminars		rs 3	0 students		0	SCH	0	h	0	h
	Exercise		2	20 students		2	SCH	16	h	62	h
	Practical of	or semina	ar 1	5 students		0	SCH	0	h	0	h
	Supervise	d self-stu	udy 6	60 students		1	SCH	16	h	0	h
3	as the basic principles and success criteria of economic action. This enables them to classify their ow engineering activities in the operational and business context and to assess and control the econom consequences/effects of their activities. In this sense, the module provides the basic business knowledge and the basic structures for interdisciplinary thinking and action.						conomic				
	<ul> <li>Classification, development and basic concepts of business administration</li> <li>Basic principles of economic action</li> <li>Overview of the most important business functional areas at the level of goods management and finance as well as the cross-functional areas (materials management, production, sales, investment and financing, business accounting (annual financial statements, cost accounting))</li> <li>Corporate goals and corporate key figures/key performance indicator systems</li> <li>Forms of corporate law and corporate affiliations</li> </ul>					,					
4	Forms of Self-stud	_		s and practicals	in the	form o	f face-to	o-face event	s		
5	Participat: Formal: Content:	ion requi	rements:								
6	Forms of			inotion	4 m.a.l.	on on 1	OV 0 == !	ation			
7				nination, project foredit points:	ı work	or oral	examin	iatiOII			
	Module 6	examina	tion pass								
8	Digital T	echnolo	ogies (wo	n the following s rk-integrated) I neering (work-	3.Eng.,	Mecha	atronics	/Automation	n (work-in	itegrated) F	B.Eng.
9	_		-	the final grade:							
10	according Module co	_									
	Economi	st Ulrik	e Franke								

11	Other information:
	-
12	Language:
	German

Foun	Foundations of Computer Science									GDI	
	Identification Workload: number:			Credits: Study semester:		er:	Frequency of the offer		Duration	:	
3353	3353 150 h			5	1st sem.		Annual (Winter)		1 semes	1 semester	
1	1 Course:		Planned group sizes		Scope			ntact time n teaching Self-study			
	Lecture		60	60 students		2	SCH	0	h	56	h
	Tuition in seminars		30	30 students		0	SCH	0	h	0	h
	Exercise		20 students			1	SCH	8	h	46	h
	Practical or seminar		15	15 students		1	SCH	16	h	0	h
	Supervise	d self-study	60	60 students		1.5	SCH	24	h	0	h

After successful completion of the module, students master the terminology of computer science and have basic knowledge of the functioning of computer systems and computer architectures. The students know selected methods for the description and evaluation of algorithms. They can structure simple information technology problems and develop suitable solutions, as well as justify and defend them. Students have basic knowledge and initial experience in the implementation of algorithms in the programming language C.

#### 3 Contents:

Introduction to Computer Science:

- Terms
- Definitions
- Number systems
- Representation of numbers and characters in the computer
- Methods for describing algorithms with flow charts, Nassi-Shneiderman diagram and pseudo code
- Methods for evaluating the complexity of algorithms

# Basics of computer architecture:

- Basic structure of processors
- Instruction cycle in microprocessors
- Memory hierarchy
- Bus systems

# Programming in C:

- Conditional instructions
- Loops
- Functions
- Arrays
- Pointers
- Structs
- Working with files

# Selected algorithms:

- Sorting algorithms (e.g. bubble sort and quick sort)
- Search algorithms (e.g. binary search)

4	Forms of teaching:							
	Learning materials for self-study, classroom sessions of exercises and practicals							
5	Participation requirements:							
	Formal:							
	Content:							
6	Forms of assessment:							
	Term paper, written examination, project work or oral examination							
7	Prerequisite for the award of credit points:							
	Module examination pass							
8	Application of the module (in the following study programmes)							
	Digital Technologies (work-integrated) B.Eng., Mechatronics/Automation (work-	k-integrated) B.Eng.						
	and Product-Service Engineering (work-integrated) B.Eng.							
9	Importance of the grade for the final grade:							
	according to BRPO							
10	Module coordinator:							
	Prof. DrIng. Christian Stöcker							
11	Other information:							
12	Language:							
	German							

Basi	ics of Mech	nanical Design							GDK	
Ident	tification ber:	Workload:	Credits:	Study	semeste	er:	Frequency offer	of the	Duration	n:
3253	3	150 h	5	4th se	h sem.		Annual (Summer)		1 semester	
1	Course:		Planned group sizes		Scope	;		Actual contact time /classroom teaching		7
	Lecture		60 students		2	SCH	0	h	56	h
	Tuition in seminars		30 students		0	SCH	0	h	0	h
	Exercise		20 students		2	SCH	16	h	62	h
	Practical	or seminar	15 students		0	SCH	0	h	0	h
	Supervise	ed self-study	60 students		1	SCH	16	h	0	h
	for the selection of design and machine elements and are able to select different design eleme an understanding of the functional and stress concerns and dimension them.									
	an under	estanding of the	e functional and s	tress co	oncerns	and din	iciision thei			
3	an under	estanding of the	e functional and s	tress co	oncerns	and din	iciision thei			
3	Contents: General Design of Fundame Tolerance Introduce Tasks of progress strength Selected Fastener as well a	principles of methodology are from the formal drawing (type specifications tion to strength from the strength theodion; strength production and the first bearing and the strength and the strength from the strength production.	nechanical design nd systematics and assemblies ardisation cal surfaces bes of drawings, s	etructure wing sp es and sterial be nts: ments; e	e of tec pecifica interna ehaviou	hnical d ations fo l stresse ur; influe es for cre	rawings, report technical sets; basic typences on coreating and re	oresentation surfaces) oes of stree inponent s	ess; tempo trength; ar	ral load nalytical
	Contents: General Design of Fundame Tolerance Introduce Tasks of progress strength Selected Fastener as well a	principles of nethodology are from the principles of nethodology are from the principles of standards, fits, technical drawing (type specifications at the production to strength from the strength theological production. In machine and one is the strength of the strength the production are for the strength the streng	nechanical design nd systematics and assemblies ardisation cal surfaces ses of drawings, dra n of materials: ry; external forcarameters for ma	es and terial beants:	e of teco pecifica interna chaviou exercise compor	hnical dations for stresse are; influences for creatents and	rawings, report technical sets; basic typences on coreating and red for strengt	oresentationsurfaces)  Sees of street  Surfaces of street  Surface	ess; tempo trength; ar chnical dra tion.	ral load nalytical
	Contents: General Design of Fundame Tolerance Introduce Tasks of progress strength Selected Fastener as well a	principles of nethodology and components entals of standaces, fits, technical drawing (type specifications tion to strength from the strength theology, strength periodical control in the stre	nechanical design nd systematics and assemblies ardisation cal surfaces ses of drawings, dra n of materials: ry; external forcarameters for ma connecting elemetransmission el	es and terial beants:	e of teco pecifica interna chaviou exercise compor	hnical dations for stresse are; influences for creatents and	rawings, report technical sets; basic typences on coreating and red for strengt	oresentationsurfaces)  Sees of street  Surfaces of street  Surface	ess; tempo trength; ar chnical dra tion.	ral load nalytical
3 4 5	Contents: General Design of Fundame Tolerance Introduce Tasks of progress strength Selected Fastener as well a	principles of nethodology are from the principles of nethodology are from the principles of standards, fits, technical drawing (type specifications at the production to strength from the strength theological production. In machine and one is the strength of the strength the production are for the strength the streng	nechanical design nd systematics and assemblies ardisation cal surfaces ses of drawings, dra n of materials: ry; external forcarameters for ma connecting elemetransmission el	es and terial beants:	e of teco pecifica interna chaviou exercise compor	hnical dations for stresse are; influences for creatents and	rawings, report technical sets; basic typences on coreating and red for strengt	oresentationsurfaces)  Sees of street  Surfaces of street  Surface	ess; tempo trength; ar chnical dra tion.	ral load nalytical
4	Contents: General Design of Fundame Tolerance Introduce Tasks of progress strength Selected Fastener as well a	principles of nethodology and components entals of standaces, fits, technical drawing (type specifications tion to strength from the strength theology, strength periodical control in the stre	nechanical design nd systematics and assemblies ardisation cal surfaces ses of drawings, dra n of materials: ry; external forcarameters for ma connecting elemetransmission el	es and terial beants:	e of teco pecifica interna chaviou exercise compor	hnical dations for stresse are; influences for creatents and	rawings, report technical sets; basic typences on coreating and red for strengt	oresentationsurfaces)  Sees of street  Surfaces of street  Surface	ess; tempo trength; ar chnical dra tion.	ral load nalytical

6	Forms of assessment:
	Term paper, written examination, combination examination, performance examination, project work,
	oral examination or examination during the course
7	Prerequisite for the award of credit points:
	Module examination pass
8	Application of the module (in the following study programmes)
	Mechatronics/Automation (work-integrated) B.Eng. and Product-Service Engineering (work-
	integrated) B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module coordinator:
	Prof. DrIng. Klaus Dürkopp
11	Other information:
	-
12	Language:
	German

Participation requirements:

Princ	iples of M	<b>l</b> echanics							GME		
	dentification Workload:		Credits:	Credits: Study semester: Frequency of the offer				y of the	Duration:		
3311		150 h	5 2nd s		sem.		Annual (Summer)		1 semester		
1	Course:		Planned group sizes Scope			)		contact time om teaching	Self-stud	Self-study	
-			60 students		2	SCH	0	h	56	h	
•	Tuition in	n seminars	30 students		0	SCH	0	h	0	h	
•	Exercise		20 students		1	SCH	8	h	46	h	
•	Practical	or seminar	15 students		1	SCH	16	h	0	h	
	Supervise	ed self-study	60 students		1.5	SCH	24	h	0	h	
2	<ul> <li>Learning outcomes/competences:</li> <li>Students are able to</li> <li>describe the basic relationships of statics, as the study of the equilibrium of forces in an mechanical structures at rest.</li> <li>explain geometric and temporal processes of movements, as well as their interactions forces and moments in and on mechanical structures.</li> <li>characterise the basic concepts of dynamics in their physical dimension as well as technical application.</li> <li>describe technical problems from mechanical engineering in the form of physical models</li> <li>apply the principles of virtual work both in statics and in dynamics to solve mechanical problems.</li> </ul>					ons with as their odels.					
3	Statics:  • • • • Kinemat	ricepts of mech Force – Baland Clearing  Plane central for Equilibrium of Stability of equality of equality for the principle of virtuing and kinetics and kinetics of the Dynamics of the Dynamics Principle of virtuing for the Principle of virtuin	ce – Rigid Body  Force systems  n rigid body  uilibrium position  ity  rtual work	nt							
4		Static indetern	ninate plane syst	ems							
	Self-stu	idy units, exerc	cises and practic	als in the	e form o	of face-	to-face eve	ents			

	Formal:	-					
	Content:	-					
6	Forms of assessment:						
	Term paper, wri	tten examination, project work or oral examination					
7	Prerequisite for th	e award of credit points:					
	Module examina	ation pass					
8	Application of the	e module (in the following study programmes)					
	Product-Service	Engineering (work-integrated) B.Eng.					
9	Importance of the	grade for the final grade:					
	according to BR	PO					
10	Module coordinat	or:					
	N. N.						
11	Other information						
	-						
12	Language:						
	German						

HMI	and User	Interfaces								HMI	
Identi numb	fication	Workloa	d:	Credits:	Study	semeste	er:	Frequency	of the	Duration	:
3254		150 h		5	3rd se	em.		Annual (Winter)		1 semes	ter
1	Course:			anned group siz	zes	Scope	;	Actual contact time /classroom teaching		Self-study	
	Lecture		60	students		2	SCH	0	h	56	h
	Tuition in seminars			students		0	SCH	0	h	0	h
	Exercise		20	students		2	SCH	16	h	62	h
	Practical of	or seminar	15	students		0	SCH	0	h	0	h
	Supervise	d self-stud	y 60	students		1	SCH	16	h	0	h
3	principle user inte developm  Contents:	s with the rfaces and nent proce	e correspect can teless and u	andards for the conding method is them with use it to develop on processing	ods and respect op inter	thus of to appropriate to the total	levelop blicabili or opera	user interfaty. They are	nces. They re familiar reracting v	design an with the svith machin	d model software nes.
	<ul> <li>Design basics and design methods</li> <li>Basics of input and output for computers, embedded systems and mobile devices</li> <li>Principles, guidelines and standards for the design of user interfaces</li> <li>Basics for the design of user interfaces (text dialogues and forms, menu systems, graphical interfaces, interfaces in the WWW, audio dialogue systems, haptic interaction, gestures)</li> <li>Methods for modelling user interfaces (abstract description of interaction as part of requirements analysis and the software design process)</li> <li>Development of user interfaces in an object-oriented programming language</li> </ul>										
4	Forms of teaching:										
	Learning units for self-study, classroom sessions in the form of exercises										
5	Participation requirements:										
-	Formal:	1 -									
	Content:	N	Modules	"Foundations	of Con	nputer	Science	and "Obje	ect-Oriente	ed Program	ming"
6	Forms of	assessment	:								
-				nation, projec	t work	or oral	examin	ation			
7	Prerequisi		ward of	credit points:							
			г								

8	Application of the module (in the following study programmes)
	Digital Technologies (work-integrated) B.Eng. and Product-Service Engineering (work-integrated)
	B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module coordinator:
	N. N.
11	Other information:
	-
12	Language:
	German

Indu	Industrial Control Technology											
	Identification Workload: number:			Credits:	Study	semeste	er:	Freque offer	iency o	of the	Duration	:
3117		150 h		5	4th seme	or ster	6th	Ann (Sun	ual nmer)		1 semes	ter
1	1 Course:		Pl	Planned group sizes				-		ntact time n teaching	Self-study	
	Lecture		60 students		2	SCH	0		h	56	h	
	Tuition in seminars  Exercise  Practical or seminar		30 students			0	SCH	0		h	0	h
			20 students			1	SCH	8		h	46	h
			15	students		1	SCH	16		h	0	h
	Supervise	d self-study	60	students		1.5	SCH	24		h	0	h

After successful completion of the course, the students have a basic knowledge of the essential components of an automation system and can select and use them in a solution-oriented manner. They know how conventional and PC-based controls work and can program these controls with different programming languages. They know the basics of bus systems and can name different bus systems and their areas of application. They can formally describe controls as discrete systems by means of automata, Petri nets and UML state diagrams and use these models for the methodical design of logic controllers, sequence controllers, control systems and diagnostic units.

#### 3 Contents:

Introduction to control technology

- Terms
- Definitions

### Sensors and actuators

- Standard sensors and their application (inductive, optical)
- Basics of FI and servo technology, pneumatics
- Safety functions (ST0; SS1; SS2; SOS...)

# Bus technology

- Basics of industrial communication
- Comparison of different bus systems and their areas of application

### Design and structures of industrial controls

- PLC and PC-based control
- Information processing

# Structured programming according to IEC 61131

- Graphics- and text-based programming languages
- Basics of object-oriented PLC programming

# Linkage controls

- Description of discrete systems by deterministic automata
- Model-based control design
- Practical implementation in ST and UML state diagram

Sequence controls and schedule controls Description of discrete systems Model-based design and practical implementation of the control system Error management Fault diagnosis and detection Preventive diagnosis Forms of teaching: 4 Learning units for self-study, classroom events in the form of exercises and practicals Participation requirements: 5 Formal: Content: Forms of assessment: Written exam, project work or oral exam Prerequisite for the award of credit points: Module examination pass and course assessment Application of the module (in the following study programmes) 8 Digital Technologies (work-integrated) B.Eng., Mechatronics/Automation (work-integrated) B.Eng., Product-Service Engineering (work-integrated) B.Eng. and Industrial Engineering and Management (work-integrated) B.Eng. Importance of the grade for the final grade: according to BRPO Module coordinator: 10 Prof. Dr.-Ing. Thomas Freund Other information: 11 Language: 12 German

Inno	Innovation and Project Management											
	Identification Workload: number:			Credits:	Study	semest	er:	Frequenc offer	y of the	Durat	ion:	
3211		150 h		5	3rd/4 sem.	th/5th/	7th	each sen	nester	1 sem	nester	
1	Course:	Course:		Planned group sizes			Scope		Actual contact time / classroom teaching		Self-study	
	Lecture		60 students			2	SCH	0	h	56	h	
	Tuition in seminars		30	30 students			SCH	0	h	0	h	
	Exercise		20	20 students			SCH	16	h	62	h	
	Practical or seminar		15	15 students			SCH	0	h	0	h	
	Supervise	d self-study	60	students		1	SCH	16	h	0	h	
2	Learning	outcomes/com	neten	ces.		1						

#### Students:

- are prepared to lead product development and innovation projects and teams to success in terms of holistic and strategically oriented project management (also including agile methods).
- understand the basics of project management and can use the elementary technical vocabulary.
- can explain the most important instruments of project management.
- are able to lead/manage a project in a given process-organisational project organisation.
- are able to develop and specifically use control options for different project phases (controlling of the degree of completion, cost controlling).
- can explain the specifics of team building and project management.
- can carry out the moderation of team meetings projects.
- know instruments of IT-supported project management.
- can explain the importance of corporate objectives and are able to distinguish between different management cultures.
- can name essential aspects of industrial property protection.

#### Contents: 3

- Basics of project management (terms/methods/instruments)
- Project phase models and planning systems (project preparation, project planning, project implementation, project completion)
- Agile project management
- Forms of project organisation
- Innovation and change management, self-management
- Project planning (project structure plan/cost plan/resource plan/schedule)
- Project documentation/project controlling
- Risk management
- Special features of use of methods in innovation projects

(Strategic preparation / initiation, planning, monitoring and control of innovation projects) Leading project and innovation teams (social structures, special communication situations in projects, real and virtual project work, problem analysis and concepts for action) Stakeholder management (factors influencing the successful management of projects) Methods of idea generation (creativity techniques etc.) Trainings and workshops on selected technical examples Basic aspects of industrial property protection Forms of teaching: Learning units for self-study, classroom sessions in the form of exercises Participation requirements: Formal: Content: 6 Forms of assessment: Term paper, written examination, project work or oral examination Prerequisite for the award of credit points: 7 Module examination pass Application of the module (in the following study programmes) 8 Digital Logistics (work-integrated) B.Eng., Digital Technologies (work-integrated) B.Eng., Mechatronics/Automation (work-integrated) B.Eng., Product-Service Engineering (work-integrated) B.Eng. and Industrial Engineering and Management (work-integrated) B.Eng. Importance of the grade for the final grade: 9 according to BRPO Module coordinator: 10 Prof. Dr.-Ing. Michael Fahrig Other information: 11 Language: 12 German

Mair	Maintenance and Spare Parts Management										
Ident	ification per:	Workload:		Credits:	Study	semeste	er:	Frequency offer	of the	Duration	:
3255		150 h		5	5th seme	or ster	6th	Annual (Winter)		1 semes	ter
1	1 Course:		Pla	Planned group sizes				Actual con / classroom teaching		Self-study	
	Lecture		60 students		2	SCH	0	h	56	h	
	Tuition in seminars		30 students			0	SCH	0	h	0	h
	Exercise		20 students		2	SCH	16	h	62	h	
	Practical or seminar		15	students		0	SCH	0	h	0	h
	Supervise	d self-study	60	students		1	SCH	16	h	0	h

Students demonstrate a comprehensive knowledge and understanding of the scope, characteristics and areas of maintenance. They know the sub-areas of maintenance and can apply the corresponding methods (such as Total Productive Maintenance, Lean Maintenance, Reliability centred Maintenance etc.). Students will be able to develop maintenance strategies. They have a basic knowledge of performance measurement and KPI systems and can transfer this to the processes in the company. Students have detailed knowledge of the planning and organisation of maintenance.

The students have an overview of the different spare parts strategies and can define them. They can create inventory plans and design order processing and its processes. They can explain the basics of materials management and are able to communicate orally and in writing in a technically competent and interdisciplinary manner in the field of maintenance and spare parts management. Furthermore, they assess key figures and can relate them to the maintenance and materials management in their company.

#### 3 Contents:

- Development of maintenance strategies
- Performance measurement and KPI systems

Introduction to modern methods such as:

- Total Productive Maintenance
- Lean Maintenance
- Reliability-centred maintenance

Overview of the different tasks of maintenance management

- Maintenance as a function of a company
- Planning in maintenance
- Spare parts management

## Fundamentals of Materials Management:

- Definition of spare parts strategies
- Stock planning, order handling and processes
- Storage and inventory management
- Warehouse organisation and structures

	Key figures and analyses							
	Materials management systems							
	Optimisation of spare parts management							
	Alternative supply strategies							
4	Forms of teaching:							
	Self-study units, exercises and practicals in the form of face-to-face events							
5	Participation requirements:							
	Formal: -							
	Content: -							
6	Forms of assessment:							
	Term paper, written examination, project work or oral examination							
7	Prerequisite for the award of credit points:							
	Module examination pass							
8	Application of the module (in the following study programmes)							
	Product-Service Engineering (work-integrated) B.Eng.							
9	Importance of the grade for the final grade:							
	according to BRPO							
10	Module coordinator:							
	N. N.							
11	Other information:							
	-							
12	Language:							
	German							

Coll	oquium								KOL	
Ident numb	ification per:	Workload:	Credits:	Stud	y semest	ter:	Frequence offer	y of the	Duratio	on:
3134	ļ	90 h	3	3 7th ser			Annual (Summe	r)	1 sem	ester
1	Course:		Planned group s	izes	Scope	e	Actual / classr teachin		Self-stuc	dy
	Lecture		60 students		0	SCH	0	h	90	h
	Tuition in	seminars	30 students		0	SCH	0	h	0	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical of	or seminar	15 students		0	SCH	0	h	0	h
	Supervise	d self-study	60 students		0	SCH	0	h	0	h
	orally an able to as	d justify ther	oundations, its in m independently. S gnificance for prac	Student	s can cr	ritically	question t	he results o	f their wo	ork and are
3	Contents:									
		-	olements the bach	elor the	sis and	is to be	assessed i	ndependent	ly.	
		of the thesis								
	Disputation the thesis	-	such as: the prepa	aration	of the th	nesis and	l the issue	es that arose	in the co	ntext of
4	Forms of	teaching:								
•	Oral exa	•								
5		ion requiremen	nts:							
	Formal:	All	modules of the stu is must be success				e success	fully compl	eted. The	bachelor
	Content:	Trea	atment of the bach	nelor the	esis					
6		assessment:								
	Oral exa									
7	Prerequisi	te for the awa	rd of credit points:							
8	Application of the module (in the following study programmes)  Digital Logistics (work-integrated) B.Eng., Digital Technologies (work-integrated) B.Eng.,  Mechatronics/Automation (work-integrated) B.Eng., Product-Service Engineering (work-integrated)  B.Eng. and Industrial Engineering and Management (work-integrated) B.Eng.									
9	Importance of the grade for the final grade:									
		g to BRPO								
10	Module coordinator:  N. N.									
10	N. N. Other information:									
11		ormation:								

Cost	Cost Accounting/Product Costing										X.
Ident numb	ification per:	Workload:		Credits:	Study	semeste	er:	Freque offer	ncy of the	Duratio	on:
3256	j	150 h		5	3rd se	em.		Annua (Winte		1 sem	ester
1	Course:		Pla	Planned group sizes					al contact time sroom teaching	Self-stu	dy
	Lecture		60 students		2	SCH	0	h	56	h	
	Tuition in seminars		30 students		0	SCH	0	h	0	h	
	Exercise		20 students		2	SCH	16	h	54	h	
	Practical or seminar		15	15 students		0	SCH	0	h	0	h
	Supervise	d self-study	60	students		1.5	SCH	24	h	0	h
_	T .		—								

The students know different cost type calculations and can describe them. They know the basics of modern cost and activity accounting and can establish the connection to external accounting. They have an overview of the methods and systems of classical cost and activity accounting and can point out the interfaces to current controlling instruments. They can explain the basic principles of cost type accounting for personnel, material costs and machine wear and are able to carry them out. They will gain an insight into cost centre accounting to optimise administration and sales overheads and to determine hourly rates for personnel and machinery. They understand the essential principles of cost unit accounting for the calculation of prices by means of overhead calculation including post-calculation and have the knowledge to interpret and carry out these calculations.

They will gain knowledge in the area of direct costing for profit optimisation and breakeven analysis. The students can select appropriate procedures based on fixed and variable cost shares. They are capable of flexible budgeting for future-oriented budgeting and for the analysis of consumption, performance and employment variances.

They have knowledge of how to prepare product launch accounting. They can use ERP systems in the area of cost and activity accounting.

They will gain a basic understanding of the background of production theory and typical operational decision-making problems.

#### 3 Contents:

Basic concepts of cost/activity accounting

Cost-type accounting

Cost centre accounting

Cost unit accounting

Operational accounting sheet (BAB)

Contribution margin accounting

Planned cost accounting

Short-term profit and loss statement

Product launch statement

Planned cost statement

Process cost accounting

	Use of ERP syst	Service management (e.g. taxes, transfer pricing) Use of ERP system in the area of cost and activity accounting								
4	Forms of teaching:									
	Self-study units	, exercises and practicals in the form of face-to-face events								
5	Participation requ	irements:								
	Formal:	-								
	Content:	-								
6	Forms of assessm	ent:								
	Term paper, written examination, project work or oral examination									
7	Prerequisite for the award of credit points:									
	Module examination pass and course assessment									
8	Application of the module (in the following study programmes)									
	Product-Service Engineering (work-integrated) B.Eng.									
9	Importance of the grade for the final grade:									
	according to BRPO									
10	Module coordinator:									
	N. N.									
11	Other information	:								
	-									
12	Language:									
	German									

Exercis Practica Supervi	in seminars  e al or seminar  ised self-study  g outcomes/con  The students to its practic  They maste practical app  They classis support vec decision tree  They use art (also for tim  They know	s explain the history al applications. In the use of comp olication. By data using class for machines) and es or discriminant a difficial neural netwo e series).	y and basesification the control of	Scope 2 0 1 1 1 ssics of mension method for this earn m	SCH SCH SCH SCH SCH SCH of archine	/ classed teaching 0 0 8 16 16 16 e learning tion and m statistificial neutron abetween a statistic between a statistic distribution and the statistic dist	contact time com g h h h h h cand establifeature selections arbitrary input	Self-stu  56 0 54 0 o sh the relection m g theory ks. They	h h h h h elationshi nethods i (such a day also us
Lecture Tuition  Exercis Practica Supervi  Learnin  Content	in seminars  e al or seminar  ised self-study  g outcomes/con  The students to its practic  They maste practical app  They classis support vec decision tree  They use art (also for tim  They know	60 students 30 students 20 students 15 students 60 students 60 students sexplain the historyal applications. The use of composition of the use of composition of the use of composition of the use of discriminant a difficial neural network eseries).	y and basesification the control of	2 0 1 1 1 1 asics of mension mether field for this	SCH SCH SCH SCH SCH SCH of archine	/ classed teaching 0 0 8 16 16 16 e learning tion and m statistificial neutron abetween a statistic between a statistic distribution and the statistic dist	h h h h h h cand establifeature selections arbitrary input	56 0 54 0 0 sh the re ection m g theory ks. They	h h h h h elationshi nethods i (such a day also us
Tuition  Exercis Practica Supervi  Learnin	in seminars  e al or seminar  ised self-study  g outcomes/con  The students to its practic  They maste practical app  They classis support vec decision tree  They use art (also for tim  They know	30 students 20 students 15 students 60 students sexplain the historyal applications. r the use of complication. fy data using class tor machines) and es or discriminant a difficial neural network e series).	mon din ssification from the analysis f orks to le	0 1 1 1 sics of mension method for this earn m	SCH SCH SCH SCH SCH of machine n reduct hods frod d of artis purpose appings	8 16 16 16 ion and m statistificial neue.	h h h h and establi feature selected learning aral network	0 54 0 0 sh the rection meg theory ks. They	h h h h elationshi nethods i (such a day also us
Exercise Practical Superviolation of the content of	e al or seminar ised self-study ag outcomes/cor The students to its practic They maste practical app They classis support vec decision tree They use art (also for tim They know	20 students 15 students 60 students sexplain the historyal applications. r the use of complication. fy data using clastor machines) and es or discriminant a difficial neural network e series). different methods	mon din ssification from the analysis f orks to le	1 1 1 1 1 asics of mension method for this earn m	SCH SCH SCH SCH on reduct spurpose appings	8 16 16 16 ion and m statistificial neue. between a	h h h and establic feature selection selection in the sel	sh the relection meg theory ks. They	h h h elationshi nethods i (such a day also us
Practical Superviols  2 Learnin  • • • • • • • • • • • • • • • • • •	al or seminar ised self-study  g outcomes/con The students to its practic They maste practical app They classis support vec decision tree They use art (also for tim They know	15 students  60 students  sexplain the history all applications.  rether use of compolication.  fy data using class tor machines) and less or discriminant a difficial neural network eseries).  different methods	mon din ssification from the analysis f orks to le	1 1 nsics of mension method for this earn m	SCH SCH SCH reduct mods frod d of artist purpose	16 16 e learning ion and m statisti ificial neu e. between a	h h and establic feature selection selection in the selec	on the respection of the ory the out and o	h h elationshi nethods i (such a day also us
Supervi	ised self-study  Ig outcomes/con  The students to its practic  They maste practical app  They classis support vec decision tree  They use art (also for tim  They know	60 students mpetences: s explain the history al applications. r the use of compolication. fy data using class tor machines) and es or discriminant a ificial neural netwo e series). different methods	mon din ssification from the analysis f orks to le	asics of mension method for this earn m	SCH  machine n reduct  mods from d of articles purpose appings	16 e learning tion and m statisti fficial neu between a	h and establing feature selected learning aral network	sh the re ection m g theory ks. They	h lationshi ethods i (such a also us
2 Learnin  • • • • • • • • • • • • • • • • • •	The students to its practical appractical appractical appropries to the practical appractical appractical appractical appropries to the practical appractical appractical appropries to the practical appractical appractical appractical appropries appropri	mpetences: s explain the history al applications. r the use of compolication. fy data using class tor machines) and es or discriminant a ificial neural netwo e series). different methods	mon din ssification from the analysis f orks to le	nsics of mension on methate field for this	machine n reduct hods from d of articles purpose appings	e learning tion and m statisti fficial neu	and establi feature selectal learning aral network	sh the re ection m g theory ks. They	elationshi nethods i (such a also us
3 Content	The students to its practic They maste practical appractical appropriate the classic support vec decision tree. They use art (also for time They know	s explain the history al applications. In the use of comp olication. By data using class for machines) and es or discriminant a difficial neural netwo e series).	mon din ssification from the analysis f orks to le	mension on methe he field for this earn m	n reduct nods from d of arti s purpose appings	m statisti ificial neu e. between a	feature selection selection feature selection selection features in the selection sele	ection m g theory ks. They out and o	ethods i (such a also us
•	<ul> <li>(also for time series).</li> <li>They know different methods for parameter determination in artificial neural networ use them in a targeted manner.</li> <li>They explain evolutionary and genetic algorithms and apply them.</li> <li>They have a comprehensive overview of machine learning methods and can assess methods should be used in which application scenarios.</li> <li>They develop workflows for machine learning.</li> </ul>					ess whic			
•	Basics of ma Pre-processi Dimension of Statistical le Classification Artificial of topologies, of Method for	achine learning and of data reduction and feature arning theory and learning theory and learning metworks extreme learning metworks and genetic algorian machine learning	kernel m machines (self-org nachines, nation in rithms	nethods s, decis ganising , reserv artific	sion trees g maps yoir comp ial neura	, multi-l puting, et	ayer perce c.)		recurrer

5	Participation requi	irements:						
	Formal:							
	Content:	<ul> <li>Content of the mathematics modules and statistics</li> </ul>						
		<ul> <li>Advanced programming skills in Python</li> </ul>						
6	Forms of assessment:							
	Written examina	ation or oral examination						
7	Prerequisite for the award of credit points:							
	Module examination pass and course assessment							
8	Application of the module (in the following study programmes)							
	Digital Technologies (work-integrated) B.Eng. and Product-Service Engineering (work-integrated)							
	B.Eng.							
9	Importance of the grade for the final grade:							
	according to BRPO							
10	Module coordinator:							
	N. N.							
11	Other information:							
12	Language:							
	German							

	nematics I								MATH	[
Ident	ification per:	Workload:	Credits:	Study	semest	er:	Frequency offer	of the	Duration	:
3218	3	150 h	5	1st se	em.		Annual (Winter)		1 semes	ter
1	Course:	_	Planned group si	zes	Scope	e		ntact time n teaching	Self-study	
	Lecture		60 students		2	SCH	0	h	56	h
	Tuition in	n seminars	30 students		0	SCH	0	h	0	h
	Exercise		20 students		2	SCH	16	h	62	h
	Practical	or seminar	15 students		0	SCH	0	h	0	h
	Superviso	ed self-study	60 students		1	SCH	16	h	0	h
3	Contents	:	ogy, natural scientification (set theory, ineq				logic meth	ods of pro	of)	
		applications)	lculus for function (vectors, matric			·				lues and
4		C	study, classroom	session	ns in th	e form o	of exercises			
5	Participal Formal:	tion requirement - -	S:							
	Г с									
6	Written		ombined examin	ation, o	ral exa	minatio	n or examin	ation durii	ng the cour	rse
7	Written  Prerequis	examination, c	l of credit points:	ation, o	ral exa	minatio	n or examin	ation durii	ng the cour	rse
	Written  Prerequis Module Applicati Digital Mechatr	examination, c site for the award examination pa on of the module Logistics (we conics /Automa	l of credit points:	study pr B.Eng. rated) I	ogramn , Dig 3.Eng.,	nes) ital Te Produc	chnologies t-Service E	(work-in	itegrated)	B.Eng.
7	Written  Prerequis Module Applicati Digital Mechatr B.Eng. a	examination, consiste for the award examination particular to the module of the module of the module of the module of the grade for the grade	of credit points: ass e (in the following ork-integrated) tion (work-integ	study pr B.Eng. rated) I	ogramn , Dig 3.Eng.,	nes) ital Te Produc	chnologies t-Service E	(work-in	itegrated)	B.Eng.
7 8	Written  Prerequis Module Applicati Digital Mechatr B.Eng. a  Importan accordin	examination, consiste for the award examination particles on of the module Logistics (wonics /Automand Industrial Except the grade for the gra	of credit points: ass e (in the following cork-integrated) tion (work-integ Engineering and M	study pr B.Eng. rated) I	ogramn , Dig 3.Eng.,	nes) ital Te Produc	chnologies t-Service E	(work-in	itegrated)	B.Eng.
7 8	Written  Prerequis Module Applicati Digital Mechatr B.Eng. a  Importan accordir Module of	examination, consiste for the award examination particular to the module of the module of the module of the module of the grade for the grade	of credit points:  ass  e (in the following ork-integrated) ation (work-integ Engineering and M or the final grade:	study pr B.Eng. rated) I	ogramn , Dig 3.Eng.,	nes) ital Te Produc	chnologies t-Service E	(work-in	itegrated)	B.Eng.

12 Language:
German

Math	nematics II								MATH	2
Identi	ification er:	Workload:	Credits:	Study	semest	er:	Frequency offer	of the	Duration	1:
3257		150 h	5	2nd s	sem.		Annual (Summer)	)	1 semes	ster
1	Course:		Planned group si	izes	Scope	e	Actual co / classroo teaching	ontact time om	Self-study	7
	Lecture		60 students		2	SCH	0	h	56	h
	Tuition in	seminars	30 students		0	SCH	0	h	0	h
	Exercise		20 students		2	SCH	16	h	62	h
		or seminar	15 students		0	SCH	0	h	0	h
	Supervise	ed self-study	60 students		1	SCH	16	h	0	h
2	Learning	outcomes/comp	etences:							
	Students	:								
	• ;	master the esse several variabl		of integ	ral calc	ulus and				
			ew of the methor differential equa							
3	•	Complex numl Integral calcul integral calcul Differential ca differentiation Ordinary diffe	bers (definition a us for functions of us, integration ru lculus for function) rential equations as 2nd or nth order	of one vales, interest ons of se	ariable egration everal v	(fundar method ariables quations	mental theo ds, imprope s (functions s of the 1st of	rem of diff r integrals of several order, linea	, application variables, ar different	ons) partial
4	Forms of Learning	-	study, classroom	ı sessioi	ns in the	e form o	of exercises			
5	Participat	ion requirement	s:							
	Formal:	-								
	Content:		ıles: Mathematics I							
6	Forms of	assessment:								
	Written	examination, c	ombined examin	ation, o	ral exa	minatio	n or examir	nation duri	ng the cou	rse
7	_	ite for the award	of credit points:							
8			e (in the following	study pr	ogramn	nes)				
Ü	Digital T Product-	Cechnologies (v	work-integrated) eering (work-inte	B.Eng.	, Mech	atronics				
9		ce of the grade f	or the final grade:							

10	Module coordinator:
	Dr. rer. nat. Sabrina Proß
11	Other information:
	-
12	Language:
	German

	hematics I	II							MAT	Н3
[den	tification ber:	Workload:	Credits:	Study	semes	er:	Frequency	y of the	Durati	on:
3258		150 h	5	3rd s	sem.		Annual (Winter)		1 sem	ester
1	Course:		Planned group s	sizes	Scop	e	Actual of / classro teaching		Self-stu	dy
	Lecture		60 students		2	SCH	0	h	56	h
	Tuition in	n seminars	30 students		0	SCH	0	h	0	h
	Exercise		20 students		2	SCH	16	h	62	h
	Practical	or seminar	15 students		0	SCH	0	h	0	h
	Superviso	ed self-study	60 students		1	SCH	16	h	0	h
2	Learning	outcomes/comp	etences:		•			· · · · · · · · · · · · · · · · · · ·		
	Students	s:								
	•	handle numer can implemen can develop fo	t important numerical problems and t simple algorith anctions in power ith the basics and	d estima ms in a r and Fo	te erron higher ourier s	rs of num program eries.	nerical cal ming lang	culations. uage on a c	omputer	
3	Contents	:								
	•		nerical determin ation of different			numerica	ıl differen	tiation, num	erical in	tegration
	•		levelopment (inf	_	,					
		Power series of		ınıte ser	ies, po	wer serie	s. Tavlor	series)		
	•	Fourier series	ie veropinent (iii	ınıte ser	ies, po	wer serie	s, Taylor	series)		
		Fourier series	•	ınıte ser	ies, po	wer serie	s, Taylor	series)		
	•	Fourier series Fourier transfe	orm	inite ser	ies, po	wer serie	s, Taylor	series)		
	•	Fourier series	orm	inite ser	ies, po	wer serie	s, Taylor	series)		
4	Forms of	Fourier series Fourier transfe Laplace transf Use of Matlab teaching:	orm form /C++/Python							
4	Forms of	Fourier series Fourier transfe Laplace transf Use of Matlab teaching:	orm							
	Forms of Learning	Fourier series Fourier transfe Laplace transf Use of Matlab teaching:	orm form //C++/Python -study, classroon							
	Forms of Learning	Fourier series Fourier transfe Laplace transf Use of Matlab  teaching: g units for self	orm form //C++/Python -study, classroon							
	Forms of Learning	Fourier series Fourier transfe Laplace transf Use of Matlab teaching: g units for self tion requiremen	orm form //C++/Python -study, classroon							
	Forms of Learning Participa Formal:	Fourier series Fourier transfe Laplace transf Use of Matlab  teaching: g units for self tion requiremen - Mod	form  form  form  //C++/Python  -study, classroon  ts:  ules:							
	Forms of Learning Participa Formal:	Fourier series Fourier transfe Laplace transf Use of Matlab  teaching: g units for self tion requiremen - Mod 3218	orm form form /C++/Python -study, classroon ts: ules: Mathematics I;							
5	Forms of Learning Participa Formal: Content:	Fourier series Fourier transfe Laplace transf Use of Matlab  Teaching: g units for self  tion requiremen  -  Mod 3218 3257	form  form  form  //C++/Python  -study, classroon  ts:  ules:							
5	Forms of Learning Participa Formal: Content:  Forms of Written	Fourier series Fourier transfe Laplace transf Use of Matlab  teaching: g units for self  tion requiremen  - Mod 3218 3257 assessment: examination, of	orm form form /C++/Python -study, classroon ts: ules: Mathematics I;	n sessio	ns in th	e form o	f exercise	S	xaminat	ion durin
6	Forms of Learning Participa Formal: Content:  Forms of Written the cour	Fourier series Fourier transfe Laplace transf Use of Matlab  teaching: g units for self  tion requiremen  - Mod 3218 3257 assessment: examination, ose	orm form form form form form form form f	n sessio	ns in th	e form o	f exercise	S	xaminat	ion durin
5	Forms of Learning  Participa Formal: Content:  Forms of Written the cour Prerequise	Fourier series Fourier transfe Laplace transf Use of Matlab  teaching: g units for self  tion requiremen  -  Mod 3218 3257 assessment: examination, ose site for the awars	orm form form form form form form form f	n sessio	ns in th	e form o	f exercise	S	xaminat	ion durin
6	Forms of Learning  Participa Formal: Content:  Forms of Written the cour Prerequis Module	Fourier series Fourier transfe Laplace transf Use of Matlab  teaching: g units for self  tion requiremen  - Mod 3218 3257 assessment: examination, ose site for the awar examination p	orm form form form form form form form f	n session	ns in th	e form o	f exercise	S	xaminat	ion durir
5 6 7	Forms of Learning Participa Formal: Content:  Forms of Written the cour Prerequis Module Applicati Mechatr	Fourier series Fourier transfe Laplace transfe Use of Matlab  Teaching: g units for self  tion requiremen  -  -  Mod 3218 3257 assessment: examination, ose site for the awar examination p ion of the modul	orm form form form form form form form f	n session mination	ns in th	e form o	f exercise	s nination or e		

10	Module coordinator:
	Dr. rer. nat. Sabrina Proß
11	Other information:
	-
12	Language:
	German

Met	rology/Ser	isors							MTSC	)
Ident	ification	Workload:	Credits:	Stud	y semest	er:	Frequenc	y of the	Duratio	on:
3266		150 h	5	3rd s	sem.		Annual (Winter)		1 sem	ester
1	Course:		Planned group s	izes	Scope	2)	Actual (		Self-stud	ly
	Lecture		60 students		2	SCH	0	h	56	h
	Tuition in	n seminars	30 students		0	SCH	0	h	0	h
	Exercise		20 students		1	SCH	8	h	46	h
	Practical	or seminar	15 students		1	SCH	16	h	0	h
	Supervise	ed self-study	60 students		1.5	SCH	24	h	0	h
2	Learning	outcomes/co	mpetences:			ļ	1			
	They ca to assess results.	n analyse most the quality	e them in conjuncti etrological problem (i.e. measurement u	s and fi	nd solu	tions to	them. The	students ha		_
3	Contents									
	Content	s:								
	Basic co	oncepts of m	easurement technol	logy						
		ement uncer								
	-		lom error, error pro	pagatio	n					
			nts and sensors							
			neasuring instrume	nts						
		neasuring ir								
		_	g instruments	1			4	.1.		
			conversion of physical	icai qua	ntities i	nto elec	trical sign	ais		
			ctrical quantities	oda						
		_	measurement meth L, C. Measuring bri							
			ctric and magnetic	_	antities					
			chanical quantities	ricia qu	untities					
		and angle m								
	_	nd force mea								
	Speed a	nd velocity i	measurement							
	-	-	neasurement							
		measureme								
			cess variables							
			rmal variables							
		easurement								
		y measurem								
			ioactive quantities							
4		ement of opt teaching:	ical quantities							
4		_	ercises and practical	als in th	e form	of face-	to-face ev	ents		
5	Participa	tion requirem	ents:							
		1								
	Formal:	-								

6	Forms of assessment:
	Term paper, written examination, project work or oral examination
7	Prerequisite for the award of credit points:
	Module examination pass and course assessment
8	Application of the module (in the following study programmes)
	Product-Service Engineering (work-integrated) B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module coordinator:
	Prof. Dr. Werner Schwerdtfeger
11	Other information:
	-
12	Language:
	German

Obje	ct-Oriente	d Programmin	ıg						ООР	
Identi	fication	Workload:	Credits:	Study	semeste	er:	Frequency offer	of the	Duration	1:
3267	61.	150 h	5	2nd s	em.		Annual (Summer)		1 semes	ter
1	Course:		Planned group si	zes	Scope	;	Actual co	ontact time om	Self-study	7
	Lecture		60 students		2	SCH	0	h	56	h
	Tuition in	seminars	30 students		0	SCH	0	h	0	h
	Exercise		20 students		1	SCH	8	h	46	h
	Practical	or seminar	15 students		1	SCH	16	h	0	h
	Supervise	ed self-study	60 students		1.5	SCH	24	h	0	h
3	problem:	s. The students	elected design pat s have gained kno	owledge	about	selected	I models of	the UML	and can ap	ply it.
	Program	Fundamental Differences b ming in C++: Classes Objects and n Operators and Inheritance Templates Error handlin e development Design patter Waterfall mod	etween procedura  nethods d operator overloa  g : ns del, V-model	al and o			programmir	ng		
	•	Unit tests	ass diagram and s	equence	e diagra	ım)				
4	Forms of Learning	-	f-study, classrooi	m event	s in the	form o	f exercises :	and practic	eals.	
5	,	ion requirement	•					F 27		
J	Formal:	1								
	Content:	Struc	tured programmi	ng (idea	ally wit	h C), ge	eneral inform	natics basi	ics	
6		assessment: per, written ex	camination, projec	ct work	or oral	examin	ation			

7	Prerequisite for the award of credit points:
	Module examination pass
8	Application of the module (in the following study programmes)
	Digital Technologies (work-integrated) B.Eng. and Product-Service Engineering (work-integrated)
	B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module coordinator:
	Prof. DrIng. Christian Stöcker
11	Other information:
12	Language:
	German

Prac	ctical Modu	le I							PX1	
Iden num 311		Workload:	Credits:	Study 3rd s	semest	er:	Frequency offer Annual	of the	Duratio 1 seme	
							(Winter)			
1	Course:		Planned group si	zes	Scope	)	Actual co	ontact time om	Self-stud	у
	Lecture		60 students		0	SCH	0	h	150	h
	Tuition in	seminars	30 students		0	SCH	0	h	0	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical of	or seminar	15 students		0	SCH	0	h	0	h
	Supervise	d self-study	60 students		0	SCH	0	h	0	h
3			lution options arents acquire the							
	contents	of the curricu	ed on must be rela lum. The topic is iversity of applied	agreed	betweer	-				
4	Forms of Work-rel	teaching: lated module								
5	Participat	ion requiremen	ts:							
	Formal:	<u> </u>								
	Content:	-								
6	Forms of Term pag	assessment:								
7	Prerequisi		d of credit points:							
8	Application Digital Mechatro	on of the modu Logistics (vonics/Automa	le (in the following work-integrated) tion (work-integrated) Engineering and I	B.Eng ated) I	., Dig 3.Eng.,	ital Te Product	-Service E	ngineering	ntegrated) g (work-in	
9	_	-	for the final grade:							
	according	g to BRPO	for the final grade:							
9	according Module co	g to BRPO pordinator:								
10	Module co	g to BRPO oordinator: -Ing. Andrea								
	according Module co	g to BRPO oordinator: -Ing. Andrea								
10	Module co	g to BRPO coordinator: -Ing. Andrea ormation:								

Prac	tical Modu	le II								PX2	
Ident	rification ber:	Workload:		Credits:	Study	semest	er:	Frequenc offer	y of the	Duratio	on:
3122	2	150 h		5	5th s	em.		Annual (Winter)		1 seme	ester
1	Course:		Pl	lanned group siz	zes	Scope	<u></u> ;	Actual / classr teachin		Self-stud	dy
	Lecture		60	) students		0	SCH	0	h	150	h
	Tuition in	seminars	30	) students		0	SCH	0	h	0	h
	Exercise		20	) students		0	SCH	0	h	0	h
	Practical of	or seminar	15	5 students		0	SCH	0	h	0	h
	Supervise	ed self-study	60	) students		0	SCH	0	h	0	h
	the com	pany and s	olutio	orked on holis on options are acquire the a	devel	loped i	independ	dently. In	addition	to the pr	ofessional
3	Contents:										
3	The topic contents	cs to be wor	ulum	n must be relat . The topic is a sity of applied	greed b	oetweer	-				
3	The topic contents the exam	cs to be wor of the curric niner at the u	culum iniver	. The topic is a	greed b	oetweer	-				
	The topic contents the exam	cs to be wor of the curric niner at the u teaching: lated modul	eulum iniver	. The topic is a	greed b	oetweer	-				
4	The topic contents the exam	cs to be wor of the curric niner at the u teaching: lated modul ion requirement	eulum iniver e ents:	. The topic is a sity of applied	greed t scienc	between es.	n the stu	dent, the			
4	The topic contents the exam Forms of Work-rel Participation	cs to be wor of the curric niner at the u teaching: lated modul ion requirement	eulum iniver e ents:	. The topic is a	greed t scienc	between es.	n the stu	dent, the			
4	Forms of Work-rel Participat: Content:	teaching: lated modul ion requirements assessment:	eulum iniver e ents:	. The topic is a sity of applied	greed t scienc	between es.	n the stu	dent, the			
4 5	Forms of Work-rel Participate Formal: Content: Forms of Term paper Prerequisity Module of the contents of the	teaching: lated modul ion requirement  assessment: per ite for the aw examination	e ents: odule o	. The topic is a sity of applied examination particle.	greed t scienc	Practica	n the stu	dent, the			
4 5	Forms of Work-rel Participate Formal: Content: Forms of Term pap Prerequisi Module of Application Digital Mechatro	teaching: lated modulion requirem  Modulion requirements for the award examination on of the modulion of the m	e ents: odule of pass lule (ir (work nation	. The topic is a sity of applied	ass in Factorial B.Eng.	ogramm, Dig. B.Eng.,	al Modul	dent, the second characteristics and the second characteristics are second characteristics.	s (work-in	n the com	pany and  B.Eng.
4 5 6	Forms of Work-rel Participate Formal: Content: Forms of Term pap Prerequisi Module of Application Digital Mechatro B.Eng. a	teaching: lated modulion requirement   Moduli	e ents: odule of pass lule (ir (work nation I Eng	examination particle of the following statements:  a the following statements:  a the following statements:	ass in Factorial B.Eng.	ogramm, Dig. B.Eng.,	al Modul	dent, the second characteristics and the second characteristics are second characteristics.	s (work-in	n the com	pany and  B.Eng.
4 5 6 7 8	The topic contents the example	teaching: lated modul ion requirement  assessment: per ite for the aw examination on of the mod Logistics onics/Auton nd Industria	e ents: odule of pass lule (ir (work nation I Eng	examination particular the following standard (work-integrated) (work-integrated) (work-integrated) (work-integrated)	ass in Factorial B.Eng.	ogramm, Dig. B.Eng.,	al Modul	dent, the second control of the I	s (work-in	n the com	pany and  B.Eng.
4 5 7 8	The topic contents the example	teaching: lated modulion requirements    Modulion	e ents: odule of pass lule (ir (work nation I Eng	examination particles and the following statement of the following statement of the following statement of the following and the final grade:	ass in Factorial B.Eng.	ogramm, Dig. B.Eng.,	al Modul	dent, the second control of the I	s (work-in	n the com	pany and  B.Eng.
4 5 6 7 8	The topic contents the example	teaching: lated modulion requirements for the aware examination on of the modulion of the modulion of the modulion for the modulion of the mod	e ents: odule of pass lule (ir (work nation I Eng	examination particles and the following statement of the following statement of the following statement of the following and the final grade:	ass in Factorial B.Eng.	ogramm, Dig. B.Eng.,	al Modul	dent, the second control of the I	s (work-in	n the com	pany and  B.Eng.
4 5 6 7 8	The topic contents the example	teaching: lated modul ion requirem  Mo  assessment: per itte for the aw examination on of the mod Logistics onics/Auton nd Industria te of the grad g to BRPO oordinator: -Ing. Andre ormation:	e ents: odule of pass lule (ir (work nation I Eng	examination particles and the following statement of the following statement of the following statement of the following and the final grade:	ass in Factorial B.Eng.	ogramm, Dig. B.Eng.,	al Modul	dent, the second control of the I	s (work-in	n the com	pany and  B.Eng.

Trac	ctical Modu	le III								PX3	
Iden num 312		Workload	l:	Credits:	Study 6th se	semest	er:	Frequence offer Annual	y of the	Duration 1 seme	
								(Summe	r)		
1	Course:	•	Pl	anned group siz	es	Scope	;	Actual / classr teachin		Self-stuc	ly
	Lecture		60	) students		0	SCH	0	h	150	h
	Tuition in	seminars	30	) students		0	SCH	0	h	0	h
	Exercise		20	) students		0	SCH	0	h	0	h
	Practical	or seminar	15	students		0	SCH	0	h	0	h
	Supervise	ed self-study	60	) students		0	SCH	0	h	0	h
3	the com	pany and nce, the st	solutio	orked on holis n options are acquire the a	devel	loped i	independ	dently. Ir	addition 1	to the pr	ofessional
	The topic	_									
	contents	of the curr	iculum.	n must be related. The topic is a sity of applied	greed b	oetweer	-				
	contents the exam	of the curr niner at the	iculum.	The topic is a	greed b	oetweer	-				
4	contents the exam  Forms of Work-re	of the curr niner at the teaching: lated modu	iculum. univers	The topic is a	greed b	oetweer	-				
4 5	Forms of Work-re-	of the curr niner at the teaching: lated modu ion requiren	iculum. univers	The topic is a sity of applied	greed t	between es.	n the stu	dent, the			
	contents the exam  Forms of Work-re	of the curr niner at the teaching: lated modu ion requiren	iculum. univers	The topic is a	greed t	between es.	n the stu	dent, the			
5	Forms of Work-re-	of the curr niner at the teaching: lated modu ion requiren	iculum. univers	The topic is a sity of applied	greed t	between es.	n the stu	dent, the			
5	Forms of Work-re- Participat Formal: Content: Forms of Term pa	of the currainer at the teaching: lated modulion required Massessment: per	univers	The topic is a sity of applied	greed t	between es.	n the stu	dent, the			
5	Forms of Work-rel Participat Formal: Content: Forms of Term pa Prerequis: Module of	teaching: lated modulion requirem  M - assessment: per ite for the avexaminatio	universule length of the lengt	The topic is a sity of applied examination particle.	greed t scienc	Practica	n the stu	dent, the			
5	Forms of Work-re- Participat Formal: Content: Forms of Term pap Prerequise Module of Application Digital Mechatro	teaching: lated modulion requirem  assessment: per ite for the avexaminatio on of the modulion	universule	The topic is a sity of applied	greed to science associated presented B.Eng.	ogramm, Dig. B.Eng.,	al Modul	dent, the	es (work-in	n the com	pany and  B.Eng.
5 6 7	Forms of Work-rel Participat Formal: Content: Forms of Term pay Prerequise Module of Application Digital Mechatre B.Eng. a	teaching: lated modulion requirem  assessment: per ite for the avexamination of the modulion o	universulate unive	examination particle of the following solution integrated (work-integrated)	greed to science associated presented B.Eng.	ogramm, Dig. B.Eng.,	al Modul	dent, the	es (work-in	n the com	pany and  B.Eng.
5 6 7 8	Forms of Work-re: Participat Formal: Content: Forms of Term pai Prerequis: Module of Application Digital Mechatro B.Eng. a  Importance accordin Module of	teaching: lated modulion requirem  assessment: per ite for the avexamination of the modulion o	univers  uni	examination particle of the following state o	greed to science associated presented B.Eng.	ogramm, Dig. B.Eng.,	al Modul	dent, the	es (work-in	n the com	pany and  B.Eng.
5 6 7 8 8	Forms of Work-re: Participat Formal: Content: Forms of Term pa Prerequis: Module of Application Digital Mechatro B.Eng. a  Important accordin Module of Prof. Dr.	teaching: lated modulion requirem  assessment: per ite for the avexamination of the modulion o	univers  uni	examination particle of the following state o	greed to science associated presented B.Eng.	ogramm, Dig. B.Eng.,	al Modul	dent, the	es (work-in	n the com	pany and  B.Eng.
5 6 7 8 8	Forms of Work-re: Participat Formal: Content: Forms of Term pai Prerequis: Module of Application Digital Mechatro B.Eng. a  Importance accordin Module of	teaching: lated modulion requirem  assessment: per ite for the avexamination of the modulion o	univers  uni	examination particle of the following state o	greed to science associated presented B.Eng.	ogramm, Dig. B.Eng.,	al Modul	dent, the	es (work-in	n the com	pany and  B.Eng.
5 6 7 8	Forms of Work-re: Participat Formal: Content: Forms of Term pa Prerequis: Module of Application Digital Mechatro B.Eng. a  Important accordin Module of Prof. Dr.	teaching: lated modulion requirem  assessment: per ite for the avexaminatio on of the modulion	univers  univers  univers  univers  univers  univers  univers	examination particle of the following state o	greed to science associated presented B.Eng.	ogramm, Dig. B.Eng.,	al Modul	dent, the	es (work-in	n the com	pany and  B.Eng.

Prod	Product-Service Engineering – Introduction and Overview										
Identification Workload: number:		Workload:		Credits:	Study semester:			Frequency offer	of the	Duration:	
3310		150 h		5	1st sem.		Annual (Winter)		1 semester		
1	Course:	: Pl		Planned group sizes		Scope		Actual contact time / classroom teaching		Self-study	
	Lecture		60	60 students		2	SCH	0	h	56	h
	Tuition in	seminars	30 students			0	SCH	0	h	0	h
	Exercise		20	students		1	SCH	8	h	46	h
	Practical (	or seminar 15		15 students		1	SCH	16	h	0	h
	Supervised self-study		60 students		1.5	SCH	24	h	0	h	

The students are able to overview the subject area of product service engineering and to name the essential principles of service and service performance management.

### They can

- allocate relevant examples of services to the area of hybrid service bundling. Service
  platforms and various cloud solutions that are used in the area of web services can be
  distinguished from each other.
- apply simple web-based cloud services.
- describe the process for developing services.
- explain the connections between a product and a service.
- describe the basic idea of the Internet of Things and use it to develop services.

The students have first experiences with different presentation techniques, the preparation of scientific papers and the time management, structuring and managing projects.

### 3 Contents:

Introduction to the subject area of product-service engineering

- Definition of services and smart services
- Examples of services
- Service and service management at a glance
- Definition of hybrid service bundling
- Overview of service platforms
- Introduction to cloud solutions
- Introduction to service development
- Networking, digitalisation and the Internet of Things as the basis for services
- Application of web-based cloud services.

Introduction to scientific work in the Product-Service Engineering study programme:

- Presentation techniques
- Structure and outline of (engineering) scientific papers
- Writing (engineering) scientific papers
- Project and time management

4	Forms of teaching	y:							
	Learning units f	or self-study, classroom events in the form of exercises and practicals							
5	Participation requirements:								
	Formal:	-							
	Content:	-							
6	Forms of assessm	ent:							
	Term paper, wri	tten examination, project work or oral examination							
7	Prerequisite for th	ne award of credit points:							
	Module examina	ation pass and course assessment							
8	Application of the	e module (in the following study programmes)							
	Product-Service	Engineering (work-integrated) B.Eng.							
9	Importance of the	Importance of the grade for the final grade:							
	according to BR	RPO							
10	Module coordinat	or:							
	N. N.								
11	Other information	1:							
	-								
12	Language:								
	German								

Prod	Product Development and Requirements Engineering										
Identification Workload: number:		Workload:		Credits:	Study semester:			Frequency offer	of the	Duration:	
		150 h		5	6th se	6th sem.		Annual (Summer)		1 semester	
1	1 Course:		Pla	anned group siz	es	Scope	<b>!</b>	Actual co / classroom teaching	ntact time m	Self-study	
	Lecture		60	students		2	SCH	0	h 56		
	Tuition in seminars		30	students		0	SCH	0	h	0 h	
	Exercise		20	students	2 SCH 16 h			h	54	h	
	Practical or seminar		15	students		0	SCH	0	h	0	h
Supervised self-study		60	students	1.5	SCH	24	h	0	h		

#### Students:

- can explain and apply the basic principles of product development.
- can describe and evaluate factors influencing the development of successful products.
- know the product development process and can derive corresponding tasks and processes in the various development phases.
- are able to apply creativity techniques and solution finding methods to create a concept for a product.
- can distinguish between the different design methods and identify the respective advantages and disadvantages.
- describe the categories of requirements and are able to systematically record (specify), formulate and document requirements in a structured language.
- carry out reviews, create questionnaires and evaluate the requirements according to market needs.
- create and evaluate quality metrics, version requirements, and pursue them.

# 3 Contents:

# Product development:

- Product planning, product identification, product innovation process, product development process
- Factors influencing the development of successful products
- Task and concept development
- Selected creativity techniques and solution-finding methods
- Design method and methodical construction
- Perception, interpretation and aesthetics
- Product and process optimisation
- Design Management

### Requirements Engineering:

- Categories of Requirements
- Requirements Lifecycle
- Agile processes and requirements engineer
- Creativity techniques

	A Require	ements evaluation							
		Stency management							
		•							
		ements specification and documentation							
	Description in structured language								
	_	ons, reviews and questionnaires							
	-	metrics							
	<ul> <li>Version</li> </ul>	ing and variants							
	<ul> <li>Change</li> </ul>	management and traceability							
	<ul> <li>Change</li> </ul>	management							
4	Forms of teaching	;:							
	Self-study units,	exercises and practicals in the form of face-to-face events							
5	Participation requ	irements:							
	Formal:	-							
	Content:	-							
6	Forms of assessm								
		tten examination, project work or oral examination							
7	•	e award of credit points:							
		ation pass and course assessment							
8		e module (in the following study programmes)							
		Engineering (work-integrated) B.Eng.							
9		grade for the final grade:							
	according to BR								
10	Module coordinat	or:							
	N. N.								
11	Other information								
10	I amayaaa								
12	Language: German								
	German								

Qual	lity Manag	ement								QMG		
Ident	ification per:	Workload	d:	Credits:	Study	semest	er:	Frequency of the offer		Duration:		
3201		150 h		5	4th seme	or	6th	Annual (Summer)		1 seme	1 semester	
1	Course:		P	Planned group sizes			e	Actual c / classro teaching		Self-study	у	
	Lecture		60	) students		2	SCH	0	h	56	h	
	Tuition in seminars			) students		0	SCH	0	h	0	h	
	Exercise		20	) students		2	SCH	16	h	62	h	
	Practical	or seminar	15	5 students		0	SCH	0	h	0	h	
	Supervised self-study			) students		1	SCH	16	h	0	h	
2	Learning	outcomes/c	ompeter	nces:		!	ļ	_!				
	Students											
3	<ul> <li>can determine/assess the "value" (cost/benefit) of quality for a company and can understand the development of quality management.</li> <li>understand and distinguish between the existing quality management models and can apply quality management systems in a purposeful manner.</li> <li>can integrate quality management into existing management structures of a company.</li> </ul>											
	•	Terms and Analysis o Strategies Tools, pro	quality of definite of the conformation for increased areased	management ions in qualit ests/benefits of easing and er , means, proc	y managof a QM nsuring besses of	gement system quality quality	ı 7' in the 7 planniı	company (	(PDCA cyc	le) and impro	ovemen	
				ssful use of n ality manage	_				_	t in the co	mpany	
4		teaching: idy units, e	exercise	s and practica	als in the	e form	of face-	to-face eve	ents			
5	Participat	tion require	ments:									
-	Formal:	-										
	Content:	-										
6		assessment	:									
5				ination, proje	ct work	or oral	examin	ation				
7					Ct WOIK	oi oiai	CAMIIII	ation				
7 Prerequisite for the award of credit points:												
	Module examination pass											
0	Application of the module (in the following study programmes)  Digital Logistics (work-integrated) B.Eng., Product-Service Engineering (work-in and Industrial Engineering and Management (work-integrated) B.Eng.											

9	Importance of the grade for the final grade:
	according to BRPO
10	Module coordinator:
	Prof. Dr. rer. oec. Pascal Reusch
11	Other information:
	-
12	Language:
	German

		rol Engineeri		Ια .					RTK		
lden num	tification	Workload:	Credits:	Study	semest	er:	Frequenc offer	y of the	Durat	Duration:	
312:		150 h	5	4th/5	th/6th s	sem.	each semester		1 ser	nester	
1	Course:		Planned group si	Planned group sizes			Actual time / c teachin	lassroom	Self-stu	ıdy	
	Lecture		60 students		2	SCH	0	h	56	h	
	Tuition in	seminars	30 students		0	SCH	0	h	0	h	
	Exercise		20 students		1	SCH	8	h	46	h	
	Practical	or seminar	15 students		1	SCH	16	h	0	h	
	Supervise	ed self-study	60 students		1.5	SCH	24	h	0	h	
	circuit n	nodel. In smentation of sin	all groups, the some software such as M	tudents simple p	have	gained in the grant of the gran	initial ex	on the baserience verified a	with the	design a	
	circuit n	nodel. In smentation of sin	all groups, the s	tudents simple p	have	gained in the grant of the gran	initial ex	perience v	with the	design a	
3	circuit n impleme common	nodel. In smentation of sin	all groups, the s	tudents simple p	have	gained in the grant of the gran	initial ex	perience v	with the	design a	
3	circuit n impleme common	nodel. In smentation of sin	all groups, the somple controls for software such as M	tudents simple p	have	gained in the grant of the gran	initial ex	perience v	with the	design a	
3	circuit n impleme common  Contents: Introduc	nodel. In smentation of sin	all groups, the s	tudents simple p	have	gained in the grant of the gran	initial ex	perience v	with the	design a	
3	Contents:	nodel. In smentation of simulation so	all groups, the somple controls for software such as M	tudents simple p	have	gained in the grant of the gran	initial ex	perience v	with the	design a	
3	Contents:	nodel. In smentation of simulation so simulation so tion to Control Terms  Definitions	all groups, the sample controls for software such as Months and the same such as Months are such as Months a	tudents simple p	have	gained in the grant of the gran	initial ex	perience v	with the	design a	
3	Contents:	nodel. In smentation of sinulation so simulation so tion to Control Terms Definitions Block diagrar	all groups, the some software such as Months and the software	tudents simple p	have	gained in the grant of the gran	initial ex	perience v	with the	design a	
3	Contents: Introduc  Transmi	nodel. In smentation of sinulation so control to Control Terms Definitions Block diagrar ssion link ana	all groups, the some software such as Months and the software	tudents simple p [ATLA]	have	gained in the grant of the gran	initial ex	perience v	with the	design a	
3	Contents: Introduc  Transmi	tion to Control Terms Definitions Block diagrar ssion link ana Steady-state a	all groups, the specific controls for	tudents simple p [ATLAF ATLAF viour viour liagram	have processes Simu	gained in the second se	initial exave imple	perience v	with the	design a	
3	Contents: Introduc  Transmi	tion to Control Terms Definitions Block diagrar ssion link ana Steady-state a Frequency res Determining 1	all groups, the sample controls for software such as Months and the sample controls for software such as Months and Engineering and dynamic behavior of the sample control of th	tudents simple p [ATLAF ATLAF viour viour liagram	have processes Simu	gained in the second se	initial exave imple	perience v	with the	design a	
3	Contents: Introduc  Transmi	tion to Control Terms Block diagrar ssion link ana Steady-state a Frequency res Determining to	all groups, the sample controls for software such as Months and Engineering and dynamic behas ponse and floor comathematical moreop	viour liagram dels for	have processes Simu	gained in the second se	initial exave imple	perience v	with the	design a	
3	Contents: Introduc	tion to Control Terms Block diagrar ssion link ana Steady-state a Frequency res Determining to	all groups, the sample controls for software such as Months and the sample control in th	viour liagram dels for	have processes Simu	gained in the second se	initial exave imple	perience v	with the	design a	
3	Contents: Introduc  Transmi	tion to Control Terms Block diagrar ssion link ana Steady-state a Frequency res Determining to The control to Basic structur Control loops	all groups, the sample controls for software such as Months and Engineering and dynamic behavior and dynamic behavior and floor compathematical more per of the control lostructures	viour liagram dels for	have processes Simu	gained in the second se	initial exave imple	perience v	with the	design a	
3	Contents: Introduc  Transmi	tion to Control Terms Block diagrar ssion link ana Steady-state a Frequency res Determining to The control lo Basic structur Control loop s Stability beha	all groups, the sample controls for software such as Months and the sample control is sponse and floor comathematical mootoper of the control is structures aviour of control is structures and software of control is structures.	viour liagram dels for	have processes Simu	gained in the second se	initial exave imple	perience v	with the	design a	
3	Contents: Introduc  Transmi	tion to Control Terms Definitions Block diagrar ssion link ana Steady-state a Frequency res Determining to The control lo Basic structur Control loop s Stability beha Classical line	all groups, the sample controls for software such as Months and the sample control is sponse and floor compathematical monopoper of the control is structures and control is structures and control is structures.	viour liagram dels for	have processes Simu	gained in the second se	initial exave imple	perience v	with the	design a	
3	Contents: Introduc  Transmi	tion to Control Terms Definitions Block diagrar ssion link ana Steady-state a Frequency res Determining to The control lo Basic structur Control loop s Stability beha Classical lines Simple design	all groups, the sample controls for software such as Months and Engineering and Hoor compathematical monopoper of the control lestructures ar controllers an procedures	viour liagram dels for	have processes Simu	gained in the second se	initial exave imple	perience v	with the	design a	
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	Contents: Introduc  Transmi	tion to Control Terms Definitions Block diagrar ssion link ana Steady-state a Frequency res Determining to The control lo Basic structur Control loop s Stability beha Classical lines Simple design Parameter-op teaching:	all groups, the sample controls for software such as Months and Engineering and Hoor compathematical monopoper of the control lestructures ar controllers an procedures	viour liagram dels for	have processes Simu	gained is and hink.	initial exave imple	perience vermented a	with the	design a	
4	Contents: Introduc  Transmi  Forms of Self-stu	tion to Control Terms Definitions Block diagrar ssion link ana Steady-state a Frequency res Determining to The control lo Basic structur Control loop s Stability beha Classical lines Simple design Parameter-op teaching:	all groups, the sample controls for software such as Months and the sample control leads to the structures are controllers are controllers are controllers are controls.	viour liagram dels for	have processes Simu	gained is and hink.	initial exave imple	perience vermented a	with the	design a	
<del>3</del>	Contents: Introduc  Transmi:  Forms of Self-stu	tion to Control Terms Definitions Block diagrar ssion link ana Steady-state a Frequency res Determining to The control loop s Stability beha Classical lines Simple design Parameter-op teaching: dy units, exer	all groups, the sample controls for software such as Months and the sample control leads to the structures are controllers are controllers are controllers are controls.	viour liagram dels for	have processes Simu	gained is and hink.	initial exave imple	perience vermented a	with the	design a	

6	Forms of assessment:
	Term paper, written examination, project work or oral examination
7	Prerequisite for the award of credit points:
	Module examination pass and course assessment
8	Application of the module (in the following study programmes)
	Digital Technologies (work-integrated) B.Eng., Mechatronics/Automation (work-integrated) B.Eng.,
	Product-Service Engineering (work-integrated) B.Eng. and Industrial Engineering and Management
	(work-integrated) B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module coordinator:
	Prof. DrIng. Michael Leuer
11	Other information:
	-
12	Language:
	German

Safet	Safety and Security										SAS	
	Identification Workload: number:			Credits:	Study semester:			Frequency of the offer			Duration:	
3259 150 h		150 h		5	6th sem.			Annual (Summer)		1 semester		
1	Course:		Planned group size		es Scope		Actual contact time / classroom teaching		Self-study			
	Lecture		60	60 students		2	SCH	0		h	56	h
	Tuition in seminars		30	30 students		0	SCH	0		h	0	h
	Exercise		20	students		1	SCH	8		h	46	h
	Practical or seminar Supervised self-study		15	15 students		1	SCH	16		h	0	h
			60	students		1.5	SCH	24		h	0	h

The students are familiar with various guidelines in the field of functional safety. They are able to carry out a risk assessment and develop a technical safety concept. They have acquired knowledge about different validation concepts and can apply them. The students have an overview of the Machinery Directive as well as the standards IEC 61508 and EN ISO 13849 and have the understanding to apply these to real processes and technical systems.

They are familiar with the most important aspects of IT security and can create vulnerability, threat and risk analyses as well as security plans. They analyse operating system architectures with regard to the protection mechanisms integrated in them. They derive measures and mechanisms to increase reliability. They have a critical understanding of quantitative and provable security. The students can present and advocate their security solutions in an expert panel.

They have comprehensive basic knowledge of legal and data protection and the necessary technical and organisational measures to ensure the legally required data protection.

#### 3 Contents:

### Functional safety:

- IEC 61508, ISO 13849
- Machinery Directive and Declaration of Conformity
- Risk assessment, risk analysis, performance level
- Technical safety concept
- Validation concept and traceability

#### IT security/communication security:

- Basics of computer operating systems (especially internal protection mechanisms and related architectural features)
- Reliability and security objectives (confidentiality, integrity, availability, maintainability)
- Vulnerability, threat and risk analyses and security plan
- Measures and mechanisms to increase reliability and
- Security of software and systems (cryptography, authentication, access control, protocols, firewalls, etc.)

	<ul> <li>Quantitative and provable security</li> <li>Physical layer security</li> <li>Methods against jamming</li> </ul>										
	Legal and data protection:										
	Legal basis										
	• Technic	al and organisational measures to ensure legally required data protection									
4	Forms of teaching	;									
	Self-study units,	exercises and practicals in the form of face-to-face events									
5	Participation requ	irements:									
	Formal:	-									
	Content:	-									
6	Forms of assessm	ent:									
	Term paper, wri	tten examination, project work or oral examination									
7	Prerequisite for th	e award of credit points:									
		ation pass and course assessment									
8	Application of the	e module (in the following study programmes)									
	Digital Technological	ogies (work-integrated) B.Eng. and Product Service-Engineering (work-integrated)									
	B.Eng.										
9	_	grade for the final grade:									
	according to BR										
10	Module coordinat	or:									
	N. N.										
11	Other information	:									
	-										
12	Language:										
	German										

Servi	Service Engineering										SVE	
Identi	fication	Workload:		Credits:	Study	semeste	er:	Frequency offer	of the	Duration	n:	
3260		150 h		5	4th se	em.		Annual (Summer)		1 semester		
1	Course:		Pla	anned group siz	zes	Scope	:	Actual co / classroo teaching	ntact time m	Self-study	7	
	Lecture		60	students		1	SCH	0	h	27	h	
	Tuition in	seminars	30	students		0	SCH	0	h	0	h	
	Exercise		20	students		3	SCH	24	h	75	h	
	Practical	or seminar	15	students		0	SCH	0	h	0	h	
	Supervise	d self-study	60	students		1.5	SCH	24	h	0	h	
3	The students have a comprehensive overview in the field of service engineering and can reproduce it. They know the basic terms on the subject of service engineering and can apply them in a technical discussion. They understand the essential principles of service modelling and service development and are thus able to design customised services for the customer or for their company. They develop services using simple examples from practice and apply the methods and processes they have learned. Students are able to describe and explain process models in service engineering. They know the necessary creativity techniques and use them to develop value-added services. With the help of the "service blueprinting" approach, they describe services and shape them at the same time.  Contents:  • Introduction to the topic • Motivation for dealing with service engineering issues • Clarification of basic terms • Process models in service engineering • Relationship between service engineering • Relationship between service engineering • Identification of innovative value-added services (VAS) with creativity techniques • Acquisition of development partners with the help of the "lead user" approach • Description of value-added services with the help of the "service blueprinting" approach • Development of a service with the methods learned with industrial examples											
4	Forms of Self-stu		ercises	s and practical	ls in the	form o	of face-	to-face even	its			
5	Participat	ion requirem	ents:									
5	Formal:	-										
	Content:											
6	Forms of	assessment: per, written	exami	nation, projec	et work	or oral	examin	ation				

7	Prerequisite for the award of credit points:
	Module examination pass
8	Application of the module (in the following study programmes)
	Product-Service Engineering (work-integrated) B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module coordinator:
	N. N.
11	Other information:
	-
12	Language:
	German

Participation requirements:

Formal: Content:

Serv	vice Comm	unication and	Training Concep	ts					SKTK		
	tification ber:	Workload:	Credits:	Study	/ semest	er:	Frequency offer	of the	Duratio	on:	
3261		150 h	5	5th seme	or ester	6th	Annual (Summer	)	1 sem	ester	
	Course:		Planned group s.	izes	Scope	;		ontact time om teaching	Self-stuc	ly	
	Lecture		60 students		2	SCH	0	h	56	h	
		n seminars	30 students		0	SCH	0	h	0	h	
	Exercise		20 students		2	SCH	16	h	62	h	
	Practical	or seminar	15 students		0	SCH	0	h	0	h	
	Supervise	ed self-study	60 students		1	SCH	16	h	0	h	
	create a	training conce are able to co	unication and cus ept. They create to sorvey didactically	raining	docume	ents and	structure	them with	SGML/X	ML. T	
	Contents:										
			ation Manageme								
			methods of infor		_						
		_	roducts in the cor				et				
		, ,	rocess-oriented in base-supported in			_	<b>.</b> .				
	_		oase-supported in on, granulation, m			lagemen	t:				
			edge managemen		Sunon						
	•		delimitation of		nt, info	rmation	and know	ledge			
		Madla ada	quisites and tools of knowledge management								
			equisites and tools of knowledge management (XML as a structuring method for extensive information colle						ections:		
	Elements and methods in SGML/XML document creation     Training methods and didactics										
	•	tion to SGML Elements and	XML as a struct methods in SGM	L/XML				nation con	•••••		
1	Forms of	tion to SGML Elements and Training meth teaching:	/XML as a struct methods in SGM tods and didactics	IL/XML	docun	nent crea	tion				
	Forms of	tion to SGML Elements and Training meth teaching:	XML as a struct methods in SGM	IL/XML	docun	nent crea	tion				

6	Forms of assessment:
	Term paper, written examination, project work or oral examination
7	Prerequisite for the award of credit points:
	Module examination pass
8	Application of the module (in the following study programmes)
	Product-Service Engineering (work-integrated) B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module coordinator:
	N. N.
11	Other information:
	-
12	Language:
	German

		s and Devices	1				-		SMSD	
dent numl	ification er:	Workload:	Credits: Stu		semest	er:	Frequency of the offer		Duration:	
3262		150 h	5	5th seme	or 6th		Annual (Winter)		1 semester	
Course:			Planned group s	izes	Scope	е	Actual co	ontact time om	Self-study	7
	Lecture		60 students		2	SCH	0	h	56	h
	Tuition in	n seminars	30 students		0	SCH	0	h	0	h
	Exercise		20 students		2	SCH	16	h	62	h
	Practical	or seminar	15 students		0	SCH	0	h	0	h
	Superviso	ed self-study	60 students		1	SCH	16	h	0	h
and networking of sma define the interfaces.			irt devices, can e	stablish	a conn	ts have lection to		et of Thing	gs and are	able to
	define th	ne interfaces.	irt devices, can e	stablish	a conn			et of Thing	gs and are	able to
3	Contents	ne interfaces.		stablish	a conn			et of Thing	gs and are	able to
3	Contents	e interfaces.  Smart Service	s	stablish	a conn			et of Thing	gs and are	able to
	Contents	: Smart Service: Introduction a	s nd Motivation	stablish	a conn			et of Thing	gs and are	able to
	Contents	: Smart Service: Introduction a: Digitalisation	s nd Motivation and disruption					et of Thing	gs and are	able to
	Contents  • • •	: Smart Service: Introduction a Digitalisation Identifying po	s nd Motivation and disruption tential for smart	services		ection to	o the Interne		gs and are	able to
	Contents  •	: Smart Service: Introduction a Digitalisation Identifying po Development	s nd Motivation and disruption tential for smart and specification	services		ection to	o the Interne		gs and are	able to
	Contents  • • • •	: Smart Service: Introduction a: Digitalisation Identifying po Development : Integration Pla	s nd Motivation and disruption tential for smart and specification atforms	services of smar		ection to	o the Interne		gs and are	able to
	Contents  • • • • •	: Smart Service Introduction a Digitalisation Identifying po Development Integration Pla Technologies	s nd Motivation and disruption tential for smart and specification atforms for Smart Service	services of smar	rt servi	ection to	o the Interne		gs and are	able to
	Contents  • • • • • • • • • • • • • • • • • •	: Smart Service: Introduction a Digitalisation Identifying po Development: Integration Pla Technologies: Quality and op	s  nd Motivation  and disruption  tential for smart  and specification  atforms  for Smart Service  peration of smart	services of sman	rt servi	ection to	o the Interne		gs and are	able to
	Contents  • • • • • • • • • • • • • • • • • •	: Smart Service: Introduction a: Digitalisation Identifying po Development : Integration Pla Technologies : Quality and op Historical deve	s nd Motivation and disruption tential for smart and specification atforms for Smart Service peration of smart	services of smar es services stance sy	rt servio	ection to	o the Interne		gs and are	able to
	Contents  • • • • • • • • • • • • • • • • • •	: Smart Service: Introduction a: Digitalisation Identifying po Development : Integration Pla Technologies : Quality and op Historical deve	s nd Motivation and disruption tential for smart and specification atforms for Smart Service peration of smart elopment of assist	services of smar es services stance sy	rt servio	ection to	o the Interne		gs and are	able to
	Contents  • • • • • • • • • • • • • • • • • •	: Smart Service: Introduction a: Digitalisation Identifying po Development : Integration Pla Technologies : Quality and op Historical dever	s nd Motivation and disruption tential for smart and specification atforms for Smart Service peration of smart elopment of assis enablers for smart	services of smar es services stance sy	rt servio	ection to	o the Interne		gs and are	able to
	Contents  • • • • • • • • • • • • • • • • • •	: Smart Service: Introduction a: Digitalisation Identifying po Development: Integration Pla Technologies: Quality and op Historical deve Technological Smart devices Technological	s nd Motivation and disruption tential for smart and specification atforms for Smart Service peration of smart elopment of assis enablers for smart	services of smar es services stance sy	rt servio	ection to	o the Interne		gs and are	able to
	Contents  Contents	: Smart Service: Introduction a: Digitalisation Identifying po Development: Integration Pla Technologies: Quality and op Historical deve Technological Smart devices Technological	s nd Motivation and disruption tential for smart and specification atforms for Smart Service peration of smart elopment of assis enablers for smart equipment on and networkin	services of smar es services stance sy	rt servio	ection to	o the Interne		gs and are	able to
	Contents  • • • • • • • • • • • • • • • • • •	: Smart Services Introduction a Digitalisation Identifying po Development Integration Pla Technologies Quality and op Historical devices Technological Smart devices Technological Communication User interfaces	s nd Motivation and disruption tential for smart and specification atforms for Smart Service peration of smart elopment of assis enablers for smart equipment on and networkin	services of smar es services stance sy art device	rt services s systems sees	ection to	o the Interne		gs and are	able to

	Formal:	-
	Content:	-
6	Forms of assessme	ent:
	Term paper, wri	tten examination, project work or oral examination
7	Prerequisite for th	e award of credit points:
	Module examina	ation pass
8	Application of the	e module (in the following study programmes)
	Product-Service	Engineering (work-integrated) B.Eng.
9	Importance of the	grade for the final grade:
	according to BR	PO
10	Module coordinat	or:
	N. N.	
11	Other information	
	-	
12	Language:	
	German	

Stati	stics									STA	Γ	
Ident	ification per:	Workload:		Credits:	Stud	y semes	ter:	Frequency of the offer each semester		Duration:		
3224		150 h		5	3rd sem	or ester	4th			1 semester		
1	Course:		P	Planned group s	sizes	Scop	e	Actual / classr teachin		Self-stu	ıdy	
	Lecture		6	0 students		2	SCH	0	h	56	h	
	Tuition in	n seminai	rs 3	0 students		0	SCH	0	h	0	h	
	Exercise		2	0 students		2	SCH	16	h	62	h	
	Practical	or semin	ar 1	5 students		0	SCH	0	h	0	h	
	Supervise	ed self-st	udy 6	0 students		1	SCH	16	h	0	h	
2	Learning	outcome	s/compete	nces:		ļ	1		<u> </u>		<b>+</b>	
	Students	:										
	•	can app are able correlat	ly the bas to analys ions.	concepts of sic methods are economic quarks with the	nd proce uestion	edures of s and p	roblems	with stati	stical metho			
3	Contents											
				tics (one-dim	ensiona	ıl freque	ency dist	tributions,	measures, i	nultivar	iate	
			_	ion analysis)	1			`				
				y (discrete an	d contir	nuous d	istributio	ons)				
			al inferen									
4	Forms of			/SPSS  If-study, classroom sessions in the form of exercises								
4		_										
5	Participat	ion requ	irements:									
	Formal:											
	Content:		_									
6	Forms of											
	_	-		nination, comb	oined ex	kaminat	ion, pro	ject work,	oral examir	nation or	•	
				ng the course								
7	_			credit points:								
0			ation pass		- at1		maa)					
8	Application of the module (in the following study programmes)  Digital Logistics (work-integrated) B.Eng., Digital Technologies (work-integrated) B.Eng. Mechatronics/Automation (work-integrated) B.Eng., Product-Service Engineering (work-integrate B.Eng. and Industrial Engineering and Management (work-integrated) B.Eng.								l) B.Eng. integrated			
9	Importan accordin		-	the final grade:								
10												
10		Module coordinator:  Dr. rer. nat. Sabrina Proß										
	Dr. rer. nat. Sabrina Proß Other information:											
11												

12 Language:
German

	hnical Eng	lish								TCE	
	lentification Workload umber:			Credits:	Study	semes	ter:	Frequency of the offer		Durati	ion:
3121		150 h		5 1st, 3rd		or 5th sem.		Annual (Winter)		1 sem	nester
1	Course:			Planned group s.	izes	Scop	e	Actual of time / c	lassroom	Self-stu	ıdy
	Lecture			60 students		2	SCH	0	h	56	h
		n seminar				0	SCH	0	h	0	h
	Exercise					0	SCH	0	h	0	h
	Practical	or semina	ır	15 students		2	SCH	32	h	46	h
	Supervise	ed self-stu	idy	30 students		1	SCH	16	h	0	h
2	Learning	outcomes	s/compete	ences:		•					
<ul> <li>Social competence presentations, team</li> <li>Methodological coanalysis of technical way that is appropredictions approprediction of the structure authentic</li> </ul>			ork and project	work.							
	analy way - Perso	vsis of tection that is appointed to the community of the	chnical propriate propriet	petence: They texts and for so te for the target : They assume	use tandolving control to the tank tank tank tank tank tank tank tank	ontext ontext	ual tasks	. They car	n present g process	technical i	issues in a
3	Contents: - Stude progrand r - They discus	rsis of ter that is apponal com ture auth ture auth ents mas ramme (emanufact possess assing rea	ter the objection of the control of	petence: They texts and for so te for the target : They assume	use tarbolving control of the property of the	nsibility oads ar ne tech mbers, Indust mailing	nical an symbols ry 4.0; log; writing	d organisa and math	ational coematical of	ontent of topperations al trade, et	heir study; materials
	Contents: - Stude progrand r - They discu	rsis of ter that is apponal com- ture auth ture auth ents mas ramme (e- manufact r possess assing rea	ter the e.g. dime uring; a interdisadings a	petence: They texts and for so te for the target : They assume aterial, organis  core terminolo ensions and sha utomated syste ciplinary skills and trends; desi	gy of the pes; nurems and se (e.g. e.g. e.g. e.g. e.g. e.g. e.g. e.	nsibility oads ar ne tech mbers, Indust mailing	nical an symbols ry 4.0; loce poste	d organisa and math	ational coematical of	ontent of topperations al trade, et	heir study; materials
4	Contents: - Stude progrand r - They discut	rsis of ter that is apponal com- ture auth ture auth ents mas ramme (e- manufact r possess assing rea	ter the object that the control of t	petence: They texts and for so te for the target : They assume aterial, organis  core terminolo ensions and sha utomated syste ciplinary skills and trends; desi	gy of the pes; nurems and se (e.g. e.g. e.g. e.g. e.g. e.g. e.g. e.	nsibility oads ar ne tech mbers, Indust mailing	nical an symbols ry 4.0; loce poste	d organisa and math	ational coematical of	ontent of topperations al trade, et	heir study ; material c.).
3 4 5	Contents: - Stude progrand r - They discut	rsis of ter that is apponal com ture auth ture auth ents mas ramme (enanufact possess assing rea	ter the object that the control of t	petence: They texts and for so te for the target : They assume aterial, organis  core terminolo ensions and sha utomated syste ciplinary skills and trends; desi	gy of the pes; nurems and se (e.g. e.g. e.g. e.g. e.g. e.g. e.g. e.	nsibility oads ar ne tech mbers, Indust mailing	nical an symbols ry 4.0; loce poste	d organisa and math	ational coematical of	ontent of topperations al trade, et	heir study ; material c.).

6	Forms of assessment:
	Combination examination
7	Prerequisite for the award of credit points:
	70% attendance and active participation, passed semester project and written exam
8	Application of the module (in the following study programmes)
	Digital Logistics (work-integrated) B.Eng., Digital Technologies (work-integrated) B.Eng., Mechatronics/Automation (work-integrated) B.Eng., Product-Service Engineering (work-integrated) B.Eng. and Industrial Engineering and Management (work-integrated) B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module coordinator:
	OStR Cornelia Biegler-König
11	Other information:
	-
12	Language:
	English

Usab	oility Engir	neering								UEG	
Ident	ification er:	Workload:		Credits:	Study	semeste	er:	Frequency offer	of the	Duration	
3263 150 h				5	5th seme	or ster	6th	Annual (Summer)		1 semes	ster
1	Course:		Pl	Planned group sizes				Actual co / classroom teaching	ntact time m	Self-study	
	Lecture		60	students		2	SCH	0	h	56	h
	Tuition in	seminars	30	students		0	SCH	0	h	0	h
	Exercise		20	students		2	SCH	16	h	62	h
	Practical or seminar			15 students		0	SCH	0	h	0	h
	Supervise	d self-study	60	students		1	SCH	16	h	0	h

The students can explain the basic terms of the topic "Usability Engineering". They know design principles and tools and can apply them. They formulate usability goals and summarise them in the form of design guidelines. They understand the essential principles of human-machine interaction and are able to depict correlations between human information processing, user-friendliness and software ergonomic quality criteria. Students create style guides based on user profiles, design principles and usability goals and can explain and represent them in professional discussions. Students learn techniques of user-centred data visualisation and can use them based on perceptual data and evaluate the psychological aspects of the relationship.

### 3 Contents:

### Introduction:

- Definitions and basic terms
- Fundamentals of user interfaces
- Basic knowledge of human-machine interaction (HMI)
- Basic models of the HMI
- Software ergonomic quality criteria of user-friendliness
- Fundamentals of human information processing

## Design guidelines

- User participation, user profile analysis, contextual task analysis
- Usability goals
- Design principles (colour, symbolism, grouping, arrangement)
- Style guide

### Process models and methods of usability engineering

- Design principles, tools
- Perceptual psychological aspects of data visualisation Techniques of data visualisation
- Usability testing using video and the style guide
- Illustration of basic knowledge using practical examples from industry
- Evaluation of human-machine interaction systems (evaluation methods, performance measurement, checklists)

#### 4 Forms of teaching:

Self-study units, exercises and practicals in the form of face-to-face events

5	Participation requ	irements:
	Formal:	-
	Content:	-
6	Forms of assessm	ent:
	Term paper, wri	tten examination, project work or oral examination
7	Prerequisite for th	e award of credit points:
	Module examina	ation pass
8	~ ~	e module (in the following study programmes)
	Product-Service	Engineering (work-integrated) B.Eng.
9	Importance of the	grade for the final grade:
	according to BR	PO PO
10	Module coordinat	or:
	N. N.	
11	Other information	t:
	-	
12	Language:	
	German	

Netv	vorking and	d IoT Solution	S							IOT	
Ident numb	ification per:	Workload:		Credits:	Study	semeste	er:	Frequency offer	of the	Duration	:
3264	3264 150 h			5	5th se	em.		Annual (Winter)		1 semes	ter
1	Course:		Planned group sizes			Scope		Actual co / classroom teaching	ntact time m	Self-study	
	Lecture		60	students		2	SCH	0	h	56	h
	Tuition in	seminars	30	students		0	SCH	0	h	0	h
	Exercise		20	students		1	SCH	8	h	46	h
	Practical or seminar		15 students		1	SCH	16	h	0	h	
	Supervise	d self-study	60	students		1.5	SCH	24	h	0	h

Students can name and explain the different layers of the ISO-OSI communication model. They know the intersections between the individual layers and can apply them. They understand the essential processes between the individual communication layers and can name the data abstraction. Students have an overview of industrial fieldbuses, they know the common protocols and can interpret them. They understand the international standardisation of fieldbuses and are able to apply it. The students have basic knowledge in the area of the OPC-UA standard. They know the standardisation and specifications and can implement OPC clients and OPC servers. They simulate different bus systems with appropriate tools and analyse the data packets sent. They can evaluate different bus technologies and classify them for different applications. The students can illustrate the correlations between the bus technologies. They are familiar with the TCP/IP protocol and can use it for IoT solutions (Internet of Things). They know the essential principles of wireless communication and can name and describe their standards. They are able to apply their knowledge in the field of industrial communication and of wireless data transmission to IoT solutions.

#### 3 Contents:

Introduction

Distributed Communication in Industrial Applications

The ISO-OSI Communication Model

Security layer: Access procedures, protocol security, reliability Switching layer: Routing and device discovery, IP protocol

Transport layer: Providing quality of service

Session layer: Transaction security of unreliable channels

Presentation layer: Character representation and character encoding

Application layer: Application protocols and services

Industrial fieldbuses

International standardisation of fieldbuses

AS-Interface, CAN, Profibus, KNX, DeviceNet, ...

Ethernet-based real-time systems

EthernetIP, EtherCAT, ProfiNet, Powerlink,

IPC Global's standards OPC-UA Standard

Wireless Communication Basics Radio Technology Bluetooth, Wifi, IEEE802.15.4, WirelessHART, ... Coexistence of radio systems Peculiarities of the radio channel From point-to-point to multi-user systems From single-hop to multi-hop Wireless sensor networks Body-area networks Infrastructure as a service Spectrum Sharing Cloud Radio Access Networks Full duplex communication Forms of teaching: 4 Self-study units, exercises and practicals in the form of face-to-face events Participation requirements: 5 Formal: Module "Foundations of Computer Science" Content: Forms of assessment: 6 Term paper, written examination, project work or oral examination Prerequisite for the award of credit points: Module examination pass and course assessment Application of the module (in the following study programmes) 8 Digital Technologies (work-integrated) B.Eng. and Product-Service Engineering (work-integrated) B.Eng. Importance of the grade for the final grade: 9 according to BRPO Module coordinator: 10 N. N. Other information: 11 12 Language: German

Cont	ract and Li	iability Law								VHR	
Ident numb	ification per:	Workload:		Credits:	Study	semeste	er:	Frequency offer	of the	Duration	
3265 150 h				5	5th seme	or ster	6th	Annual (Winter)		1 semes	ster
1	Course:		Planned group sizes			Scope		Actual con / classroom teaching		Self-study	
	Lecture		60	students		2	SCH	0	h	56	h
	Tuition in	seminars	30	students		0	SCH	0	h	0	h
	Exercise		20	students		2	SCH	16	h	62	h
	Practical or seminar			15 students		0	SCH	0	h	0	h
	Supervise	d self-study	60	students		1	SCH	16	h	0	h

Students can explain the distinction between civil law and public law. They can describe the structure of civil law. The students have an overview of the current sources and norms of private law. They understand the essential principles of private autonomy and can assess the limits within the freedom of contract. They know the legal basics of contract drafting and liability law to the extent that they can communicate with legal scholars.

They know the contents and consequences of contractual and liability law stipulations and are able to discuss these with clients.

The students can transfer the knowledge in the field of contract formation to the requirements of their own company and customers and communicate accordingly.

The students know the basic features of product liability law and can classify it in the legal system of Germany. They understand the obligations for producers resulting from product liability and have reviewed and deepened these using practical examples. Students will be able to assess and evaluate the specifics of international cooperation.

#### 3 Contents:

- The demarcation between civil law (private law) and public law
- Structure and basic concepts of civil law
- Sources and norms of private law
- Principles of freedom of contract.
- The formation of the contract (offer and acceptance), the consequences of defects of intention and error as well as rules of representation
- The purchase contract and the employment agreement
- The consequences of non-performance and poor performance
- Basic concepts of liability law
- The tort of negligence, in particular organisational negligence and breach of traffic safety obligations
- Strict liability and product liability
- Special features of international cooperation
- Basics of the law of torts

#### 4 Forms of teaching:

Self-study units, exercises and practicals in the form of face-to-face events

5	Participation requ	irements:
	Formal:	-
	Content:	-
6	Forms of assessm	ent:
	Term paper, wri	tten examination, project work or oral examination
7	Prerequisite for th	e award of credit points:
	Module examina	ation pass
8	* *	e module (in the following study programmes)
	Product-Service	Engineering (work-integrated) B.Eng.
9	Importance of the	grade for the final grade:
	according to BR	PO PO
10	Module coordinat	or:
	N. N.	
11	Other information	
	-	
12	Language:	
	German	

Sales and Customer Management								VUK			
Identification number:		Workload:		Credits:	Study semester:			Frequency of the offer		Duration:	
3255		150 h		5	7th sem.		Annual (Winter)		1 semester		
1	Course:		Pl	Planned group sizes		Scope		Actual contact time / classroom teaching		Self-study	
	Lecture		60	60 students		2	SCH	0	h	67	h
	Tuition in seminars		30	30 students		0	SCH	0	h	0	h
	Exercise 2		20	20 students		2	SCH	16	h	51	h
	Practical or seminar 1		15	15 students		0	SCH	0	h	0	h
	Supervised self-study		60	60 students		1	SCH	16	h	0	h

After successful completion of this module, students have a deeper level of knowledge in the area of sales and customer competence and can present this.

During the course, students learn methods to analyse distribution systems and processes. This enables them to understand and evaluate strategic and operative sales approaches and to apply them to relevant problems in business practice. They can assess the importance of customer management for the success of a company and know the current methods for determining customer value and instruments for building and maintaining customer relationships. Building on this, they will have the knowledge and skills to analyse methods of customer retention and apply them to new problems.

Students will be able to discuss sales and customer management problems and solutions with experts in their company at an appropriate level. They are able to realistically assess themselves and their impact on clients.

Students are able to relate to others and to think and act in a sales- and customer-oriented way.

Students master basic instruments of sales and customer management. They think in a decision- and system-oriented way and are able to work on problems in the field of sales and customer management in a theoretically sound and structured manner and find an appropriate solution.

#### 3 Contents:

Basics of sales and customer management

# Sales management:

- Planning and organisation of sales activities
- Key-figure-based strategic and operative sales planning, management and controlling
- Current challenges in sales

### Customer management:

- Situation analysis and target planning of customer management
- Process and instruments of customer assessment, customer segmentation, and customer integration in the value creation process

	<ul> <li>Elements of CRM and operational CRM</li> <li>Electronic Commerce</li> </ul>							
4	Forms of teaching:							
	Self-study units, exercises and practicals in the form of face-to-face events							
5	Participation requirements:							
	Formal:							
	Content:							
6 Forms of assessment:								
	Term paper, written examination or oral examination							
7	Prerequisite for the award of credit points:							
	Module examination pass							
8	Application of the module (in the following study programmes)							
	Product-Service Engineering (work-integrated) B.Eng.							
9	Importance of the grade for the final grade:							
	according to BRPO							
10	Module coordinator:							
Prof. DrIng. Prof. h.c. Lothar Budde								
11	Other information:							
12	Language:							
	German							

Elec	Elective Module: Product-Service Engineering							WM		
Identification number: 9017		Workload:	Credits:	Study	semest	er:	Frequency of the offer		Duration:	
		150 h	5	5th seme	5th or 6th semester		each semester		1 semester	
1	Course:		Planned group sizes		Scope		Actual contact time / classroom teaching		Self-study	
	Lecture		60 students		SCH		h		h	
	Tuition in seminars		30 students			SCH		h		h
	Exercise		20 students			SCH		h		h
	Practical or seminar		15 students		0	SCH	0	h	0	h
	Supervise	ed self-study	60 students			SCH		h		h
2	Learning outcomes/competences:									
3	Contents:									
4	Forms of teaching:									
5	Participation requirements:									
	Formal:									
	Content:									
6	Forms of assessment:									
7	Prerequisite for the award of credit points:									
8	Application of the module (in the following study programmes)									
-	~ ~		neering (work-ii		-					
9	Importance	ce of the grade	for the final grade	e:						
10	Module c	oordinator:								
	N. N.									
11	Other information:									
12	Language:									
	German									